Australian Model Engineering

January-February 2003

Issue 106

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In This Issue:
- ☑ Epoxy Sand Casting
- ☑ Melbourne's 6th Model Engineering Exhibition
- ☑ 3-Cylinder Radial Steam Engine

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January-February 2003 Issue 106

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Joe Timkiv's 3" scale Ransomes thresher ran beautifully when it was belted up to Bob Campbell's 3" Allchin at the recent Miniature Traction Engine and Road Steam Rally in Canberra. For more on this successful event turn to page 34. Photo: David Proctor

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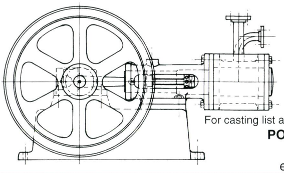

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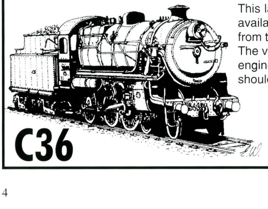

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Deadlines for issue 107

Club Roundup	**Jan 17**
Letter Box	**Jan 17**
Classified Ads	**Jan 29**
Mailout Date	**Feb 24**

Comment

Independence -v- rumour

About a year ago in this column I commented on the fact that *AME* is totally independent, has no connection with any group or organisation in the model engineering world and will not take sides on issues from within the hobby. Some information which has come back to me on two separate occasions in the last few months has prompted me to revisit this topic, though from a slightly different angle — shareholders.

Around 13 years ago, after the original *AME* ceased production, a successful rescue bid was launched which saw the magazine re-emerge with a new image and under new management. This was only achieved because several model engineers and a couple of clubs 'dug deep' into their funds and contributed the necessary cash to get the magazine back into production. They did this with the expectation that they probably would never receive a dividend on their money and just getting their money back eventually would be a good outcome. When the company was set up each contributor was issued with shares representing their financial input, some of which have since changed hands.

The issue which really bothers me is that I have recently discovered that there is a belief out there that "major shareholder(s)" have the final say over what goes into the magazine. Nothing could be further from the truth. The only person who has any say in what goes into *AME* is myself in my capacity as Managing Editor and that is because I am the person who puts it all together. No one else on this planet has any idea of what is in each issue until they receive their copy in the mail and this includes all directors and shareholders as well as the people listed in the Crew listing on this page.

Perhaps it should also be mentioned that the current shareholdings in *AME* give no one party anything like a majority shareholding or any controlling interest or even the opportunity to try to exercise any undue influence. The largest single shareholding in the company is actually less than 10% of the total. So, if anyone would have you believe they have any influence about what goes into *AME*, you can confidently say "what a load of crap!" If this situation was to change at any point in the future you would know about it fairly quickly as there would be an immediate vacancy for an Editor.

Now for a change of subject. In the past I have made the offer of space in *AME* to both the AMBSC and the AALS so that they would have a means of rapidly communicating with the greater proportion of hobbyists on matters of importance. I believe this is more efficient than relying only on club secretaries for communication, particularly when a large number of hobbyists are outside the club scene. Like any other material which goes into the magazine, these columns would be subject to *AME* editorial discretion. You will note on page 56 that the AMBSC have now taken up this offer. I believe that this is all part of what *AME* is about — a means of communication within the various fields of model engineering.

David

Join us in a great hobby!

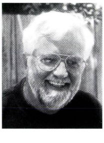
If this is your first issue of *Australian Model Engineering*, welcome!

In successive issues we cover many topics centred on that wonderful process of model engineering — alias *tinkering*.

If you're new to model engineering as well as to our magazine, you'll benefit from getting together with other model engineers — we're good at sharing ideas and saving each other money! If you don't have any contacts, start by looking in Club Round-up to find a club that's near to you. Many of our readers have discovered people with similar interests literally just around the corner.

Helping other model engineers is the simple idea of the volunteers behind this magazine. Our readers write items for us — for the same (non-existent) rate of pay! If you have ideas, opinions or techniques that you feel would be interesting to others (especially from the newcomer's angle), please drop us a line. We can send you a useful guide and help with preparing artwork or editing.

I hope you'll enjoy the great fellowship that makes our hobby special, and that you'll support our advertisers — after all, they help pay our bills!



David Proctor
Managing Editor

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introducing

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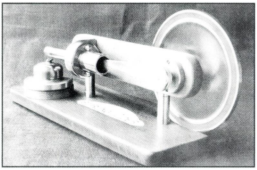

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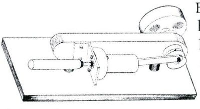

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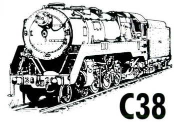

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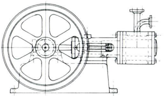

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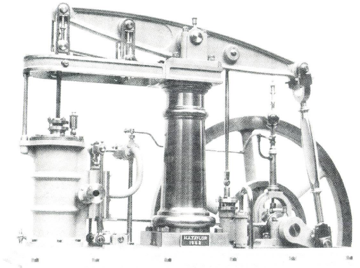

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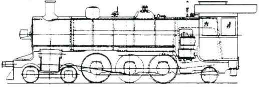

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5" A12	12	73
5" PB15	12	73
5" AC16	13	74
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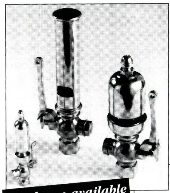

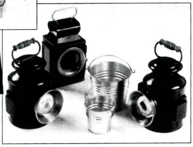

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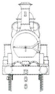

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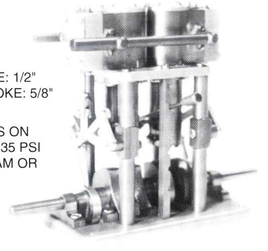

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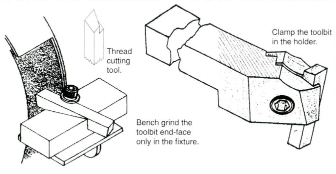
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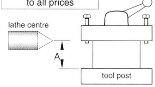

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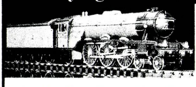

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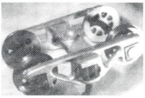

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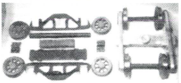

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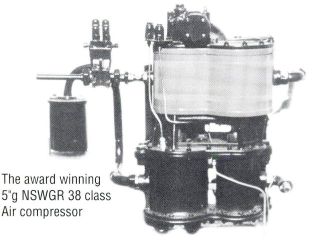

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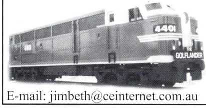

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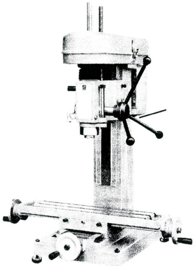

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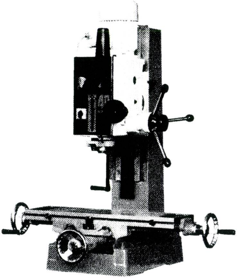

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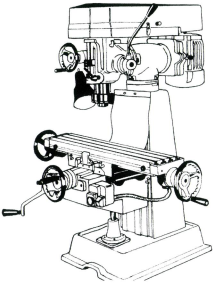

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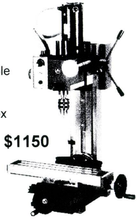

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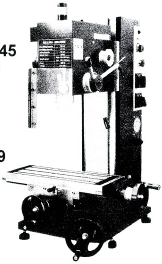

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A 3-Cylinder Radial Steam Engine

by Ernie Henne

Photos by the author unless otherwise credited

There comes a time in your model engineering life, after you have made many single cylinder steam engines, you would like to build a multi-cylinder steam engine. After realising that a single cylinder steam engine is not self-starting, a three cylinder single acting radial steam engine was decided on. Many designs were looked at over three years and none appealed to me until I read an article in *AME* No 69 by Don Payne. From the photo, I copied the engine's external shape, but I had no idea how the valve gear worked so I designed my own. Many drawings were made to see if major components would fit and to spot major errors before production started. As it happened two major errors were found after many components had been made. A lot of head scratching went on, but the problems were solved! More on that later.

First attempt at castings

When designing and building an engine like this you have to wear many hats and know everything! I must admit that I was way out of my depth in building certain parts of the engine, but being thrown into the deep end I learned new skills and hope to share them with you. As with most engines, a start is made with a crankshaft and crankcase. As I had to master basic metallurgy skills a start was made on the cylinder pattern and some cast iron was melted and poured into a mould. The casting was machined in the lathe and some porosity was found. I decided then that if I could not make flawless cylinder castings, it would not be any use trying to make the other parts. So fifteen castings later (I only needed three) I knew how to make a good cylinder casting! Some very important lessons were learnt which helped in making the other thirty iron castings needed to complete the engine. Another problem with the cylinder was that the bore was tough to machine and small threads were hard to cut with taps.

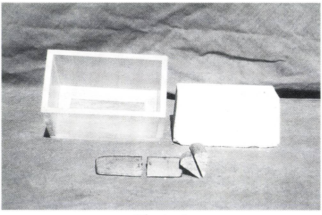


Photo 1

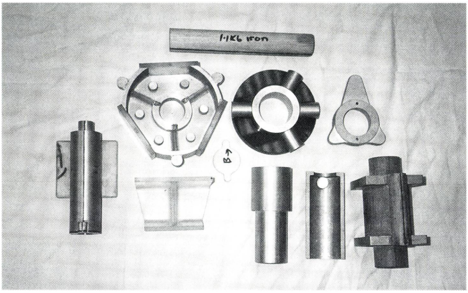


Photo 2

Making soft fine-grained cast iron

At this stage instead of using copper to soften cast iron, ferrosilicon was used as it made machining and tapping threads a lot easier and cutting tools lasted longer. Copper makes cast iron tough and wear resistant, but is not good for making soft cast iron. Ferrosilicon can make really soft cast iron, but also makes it weak and opened grained. After fifteen cylinders, a happy medium was found so the cylinders were not too hard or too soft. When a pounding was given with a sledge hammer it was found to have more than enough strength for a cylinder! There is a simple way of testing how hard or soft the iron is by pouring a sample into a wedge mould. When the iron has cooled to below red heat it can be put in a bucket of water to hasten cooling and broken in half. The colour should be mostly grey; if it is mostly white trouble can be expected when machining it. To correct this more ferrosilicon has to be added and another wedge test is made to see if the iron is mostly grey. Also a file can be used on the wedge test to see how hard or soft the iron is. The dimensions for the wedge are 12mm wide at the base, 25mm from base to the tip and 100mm wide so it can be broken in half. **Photo 1** shows the core box for wedge test mould, wedge test mould and two broken wedge tests to show what they look like. To dissolve ferrosilicon it has to be stirred in otherwise it just floats on top and does not do anything. Another way of softening the iron is to dissolve very pure graphite (plumbago) in the molten iron just before pouring.

Machining allowances

When I made the cylinder pattern, very generous machining allowances were given to compensate for poor castings to clean up to the right size. It turned out to be the right idea, because two cylinders have to be longer as they are slave cylinders and the master cylinder is shorter. A master conrod is connected to the crankshaft and has a set stroke, but slave conrods are not connected in the same pivot point and have a longer stroke. I spent a lot of time looking at the drawing and saying to myself all three strokes are the same, until a fellow model engineer who lives five minutes from me happened to drop in, took a quick look at the drawing and said the stroke will be longer. He had the gift to spot errors in drawings, a handy person to have around! Whilst on the subject of machining allowances for patterns, it can be a problem deciding just how much to put on. With a smooth skin on the casting 0.5mm is all that is needed, but that does not allow for problems such as warping or blowholes so 1.0 to 1.5mm is needed. For making cavities in castings, such as the bore in the cylinder, a core is needed and they have a habit of bending in the middle when hot metal flows around them. Extra allowance is needed, so 3.0mm is plenty. A 50mm finished bore size needs a core 44mm diameter to allow for good metal to be reached at the finished size.

Cores

A lot of core sand binders were tried, but one important property is needed after the metal has frozen around the core. The binder has to burn completely out so when the casting has cooled the core will flow out as loose sand. Did you ever wonder how water jackets are made in car engine blocks? It is easy to put the water jacket core in, but it has to be removed later on and the only way is if the binder burns out and the sand can flow out of the cavities. Cement was used as a binder and coal dust was added so that when it burnt the sand would come out easily. Another benefit from coal dust is that the sand is less likely to stick to the metal and when it comes time to machine the bore no sand means the boring bar stays sharper for longer! Another binder I used was epoxy resin. Only 1.5% resin was needed compared with cement where around 10% is needed. Epoxy resin is expensive, but it makes very strong cores even when they are very thin. One disadvantage is that it creates very acrid fumes while it burns, so the mould should be poured outdoors. A lot of hobby casters use carbon dioxide for hardening sand cores, a less expensive method can be used by dehydrating the sodium silicate binder by mixing cement or plaster with the sand, or the core can be heated gently and will make a very hard core.

Pattern making lessons

The next parts made were the crankcase halves. The pattern for this would be the most difficult I have ever made. Normally two patterns are made for two crankcase halves, so I made only one half to save a lot of work. Two castings are made from one pattern and one is turned around 180 degrees so it is a mirror image of the first one. I quickly found that if there are errors in the pattern they are doubled when turned around 180 degrees. The problem was with the bosses used to bolt the halves together. It was easy to fix by shifting the bosses a little so they would match. Other parts, which were not needed on the other half, were removed with a screwdriver and a separate mould made. One becomes a lot wiser after making many patterns! **Photo 2** shows the eight patterns used to make the thirty three iron castings.

Crankshaft and conrods

After making the two crankcase halves a start was to be made on the crankshaft. A very thorough inspection was made of my drawings to see if any more problems could be found with my design and two very big ones were found! These were the ones mentioned at the beginning of this article. Because this is a three cylinder engine all cylinders are spaced 120° apart, so I thought the spacing of the slave conrod bearing holes on the master conrod would be 120° apart. By drawing the crankshaft and master conrod at the top and bottom of all three strokes and by trial and error, the correct spacing was found to be 95°. Also on the crankcase the spacing of slave cylinders were wrong and should be about 95°. At this stage I was considering scraping the project, but after leaving it go for a week I had cooled down enough to realise that I have gone too far to back out now. Nothing could be done about the crankcase so more careful study of the master conrod was done. I noticed that by spacing the slave conrod bearing holes 95°, the piston would be at the top of the stroke at the right time, but not at the bottom. Also what happens is when the crankshaft is rotated 180° the piston does not come to the bottom of the stroke. The correct figures are power stroke 170° and exhaust stroke 190°. By now anybody reading this will be totally confused! The moral of this story is, if possible use a CAD program on your computer to design an engine like this. As one eccentric is used for three cylinders the same problem exists for the valve timing, so a lot of experimenting was done to get it right. Some months after I finished this engine I had a chance to look at some full

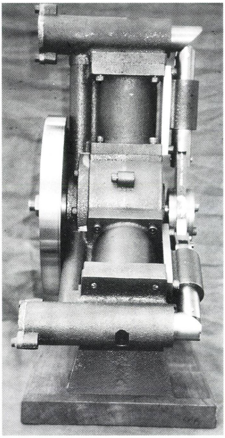
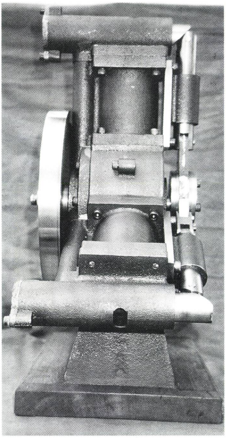


Photo 3



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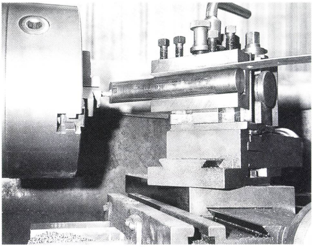

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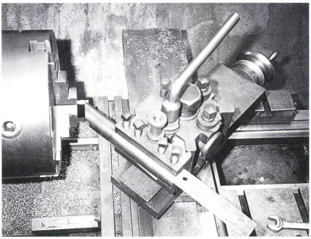


Photo 6

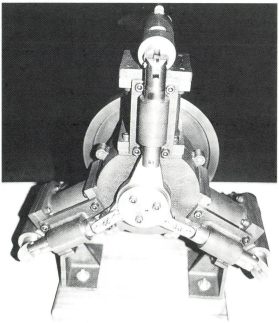


Photo 7 Photo: David Proctor

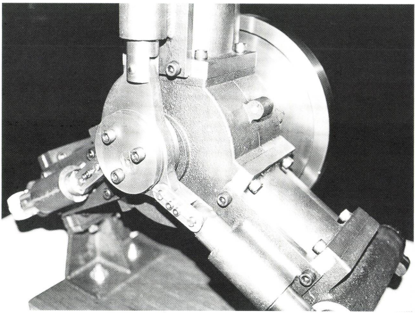


Photo 8 Photo: David Proctor

sized aeroplane engines and the designers did all the things that I did to get the engine to work! If you are going to design your own engine, go to as many museums and read as much literature as you can. My mistake was not to do enough research and thinking it was a simple job to design. There is one huge benefit in designing your own engine. It is that you get to thoroughly understand how it works and get a lot of pleasure seeing it run. One other thing I have learnt is that it is easier to change a pencil line on a drawing than it is to modify a piece of metal with a hole in the wrong place.

Design considerations

After the crankshaft was finished and assembled with the crankcase halves, it was a good feeling to know that the two most difficult parts to make were finished and a start could be made on the simple parts. Also at this stage it was starting to look like an engine and I couldn't wait to finish it. From now on three castings will need to be made from each pattern and they were small compared with the cylinder and crankcase, so a few patterns had to be in order that all the metal in the crucible could be used. One advantage in making your own castings is that instead of making the required number, one or two extra can be made in case of faulty castings or errors in machining! It can be a nasty feeling when you have bought some very expensive castings from England and either of these two things can happen. Another thing I didn't do on this engine, but is done on commercial castings is that if a group of castings can be cast as one casting, for example the crankcase halves and all three cylinders, they are made as one casting to save time and money. As this engine is a one off these rules do not apply. Since this is a prototype occasional changes have to be made and a simple pattern can be modified. Another problem that would come up occasionally, is with a simple looking casting, no thought would be given on how to hold it in a chuck. A little planning at the pattern stage would prevent these problems. That is the problem in wearing so many hats, planning means not just one move ahead, but many moves ahead.

Valve gear

The piston valves are located on top of the cylinder and a bell crank was designed to move it backwards and forwards. When the time came to make the patterns for the piston valve I thought long and hard about the bell crank idea and decided to scrap it. There were too many parts to construct, 5 pins and 5 links to transmit motion around a 90° corner, also lubricating the pins could be a problem. So about two weeks was spent working out a better system that did not need lubrication. A 45° ramp was milled on the end of the piston valve and a sealed ball bearing is used to roll along the ramp and push the piston valve in. To make the piston valve return a light spring is placed behind the valve, it also puts tension on the valve gear so there is no play. As there is only a rolling action it will last a long time before wearing out and only one pin has to be made. I chose a 45° angle because as the roller moves upward the piston valve moves exactly the same amount, at 44° or less the valve moves less and 46° or more the valve moves more. **Photo 3** shows the plunger is just starting to move upwards pushing the piston valve in. **Photo 4** shows the plunger has completed an upward stroke and is starting to move downwards. To mill the 45° ramp and do other milling jobs on various parts they were all milled in the lathe. It is something I have always wanted to try! Most jobs were very easy, but some were very difficult. Very light cuts and very fine feeds were the rule so the cutters don't grab. **Photos 5 and 6** show the two views of milling the 45° ramp in the lathe. **Photo 7 and 8** show the front view of the engine and valve gear.

Final assembly and testing

Eventually all the parts were finished and assembled and that final moment came to switch on the compressed air! To my amazement and relief it ran! Years of planning and building had come to an end. There was one thing that I was not sure about and that was if the spring returning the piston valve would be strong enough to stop the valve bouncing at high speed and it was the correct tension. With an engine this size it has a tremendous amount of power, even on 350 kPa. I could barely stall the motor. The master stroke is 50 mm and the slave strokes are 53 mm and all bores are 50 mm. As all strokes are over lapping and it is self starting in any position, there are three periods of 50° where two pistons are in the power stroke. Two 50 mm pistons are the equivalent of one 75 mm piston. If the engine runs on 4000 kPa like a Stanley steamer it would have enough power to push a small car to a fast speed. One of the pleasures of this engine is watching the valve gear working while the engine is running and if anyone is thinking of building an engine with overhead piston or slide valve I would recommend trying this arrangement. As I have been a motor mechanic for twenty-five years I have worked on a lot of engines and other types of machinery. I have wondered why they were designed with poor accessibility to work on, parts wearing out too quickly, complicated designs, expensive spare parts, etc. I learnt that it is one thing to pull apart and correctly assemble an engine, it is quite another matter to design and build your own engine! There are a lot of factors involved in building engines, such as cost, end use, resources, time to design and build it, all play a role on how it turns out. Now that I have finished, I can see in hindsight how I could have built it more quickly and more simply. Wonderful thing hindsight, pity it comes after everything has been completed!

Steam Chest

with Dave Harper

Hi there, steam fans, and welcome to another potpourri from the steam chest. I've had numerous requests to help in identifying old steam engines, and there's more this time, but it's not often that a picture in *AME* solves such a puzzle! Recently it did happen for Mark Agnew from Queensland's Granite Belt. Mark had found pieces of an old steam engine on a trip way up in North Queensland, and sent me some pictures of the bits he found. Although obviously a steam engine, a vertical twin cylinder job at that, there was no clue as to what it had been used for.

Then I received an excited email from Mark, saying 'Look at page 20 of *AME* No 104!' The winch photographed at Pearn's Steam World by our wandering editor looked exactly like the bits Mark had found! **Photos 1 and 2** show the bits.

On a subsequent trip Mark found enough other bits (easy when you know what you're looking for) to confirm the identity and is now planning a complete reconstruction. It just goes to show you have to read the right magazine.... hopefully, in the fullness of time, we'll see some photos of the complete winch!

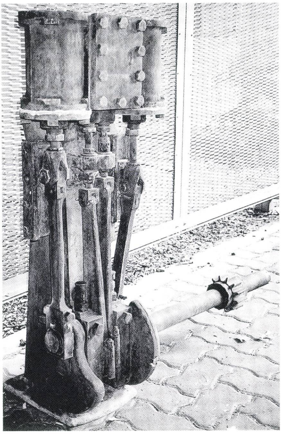


Photo 1

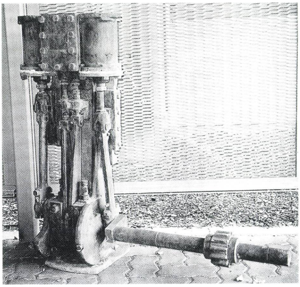


Photo 2

Feedback on Piddlers

The old steam loco toys I showed in photos 7 to 10 in Issue 104, page 30, which Warren Starr acquired recently, bought a prompt reply from Mr E Swift of Bentleigh, Victoria. (No other address given, so I haven't been able to acknowledge personally).

Mr Swift sent some photocopies from the book *Model Railway Engines* by J E Minns, published in 1969 by Universal Books of Sydney. Although not showing an exact match for Warren's models, the pictures show that these engines were probably bought from either Clyde Model Dockyard in Glasgow or Stevens Model Dockyard in London. However, there were many companies producing these toys from the 1850s right up to the First World War. Does anybody out there have any closer identification?

More from Jim Libby

As promised last time, here are some more pictures taken by Jim on his recent Tasmanian tour. At Strahan station was this imposing looking steam railway crane, which shows very little protection for the crew in that cool climate! **Photos 3 to 5** show a full view and closer shots from either side.

There must be some pretty fancy clutching and gearing on board as Jim reckons the single cylinder engine could drive the two winding drums, the slewing movement and the travelling gear as well! Sounds like a good challenge for someone to model.

There is another steam railway crane at the Rosewood Railway Museum here in Queensland. No doubt the guys from ARHS would allow any would-be modeller to clamber over and measure it if asked nicely.

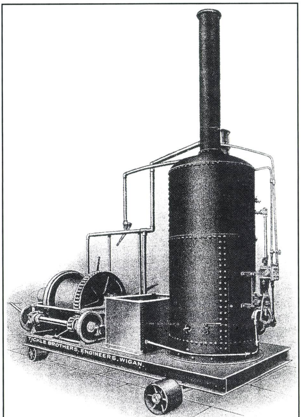

TICKLE BROTHERS, ENGINEERS, WIGAN.

Figure 1

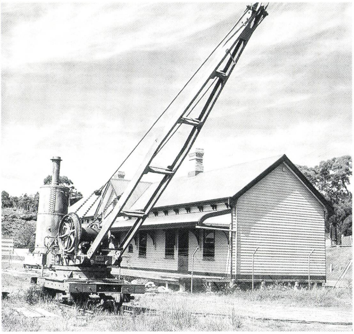


Photo 3

Another lot of stuff that Jim Libby sent me included copies from an old British Makers Associated Catalogue, once owned by his grandfather. There is a whole lot of interesting stuff in there and for this time I've picked another little winch (what else?) called a Prospecting Set with vertical boiler and engines (**figure 1**). It came mounted on solid wheels and was complete with its own little banjo feed pump. It was made in cylinder sizes from 4 - 8" bore.

One reason for choosing this item was that in browsing in a local model shop recently, I spotted some neat sets of gears designed for the model car guys. They come in a set with a small and large pinion, just crying out to be used in a model winch such as this! The price was very reasonable, around $20 from memory. A whole lot cheaper than commercial gears.

More from north Queensland

Yet another bundle of photocopies arrived recently from old friend Tony Little, way up in Chillagoe, in far north Queensland. Apparently, in return for having helped out a friend he was given an old book called *Motor Vehicles and Motors* by W. Worby Beaumont, published by Archibald Constable and Co, London in 1906.

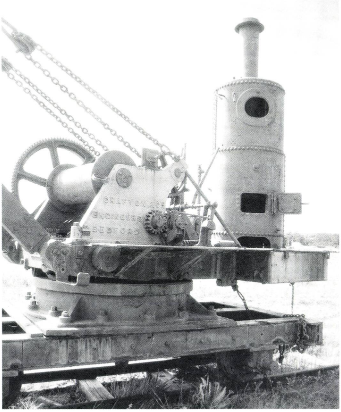


Photo 4

Although clearly in pretty poor condition, and minus its cover, this old book looks like a treasure trove of interesting information! Of particular interest are the chapters on Steam Lorries and Wagons — there are brands there I've never heard of, like Mann, Nayler, and Simpson and Bibby, among others!

As a taster, I'm including this time a side and plan view of a Thorneycroft 7-ton Steam Lorry. Although the brand name is familiar, I didn't know they'd made steam lorries! Certainly I've never seen a model of one — any takers? If anyone is really interested, I'll ask Tony to see if there are more details of the Thorneycroft in the book — at least the drawing (**figure 2**) gives some basic dimensions. I would assume that the letters tie in with some description in the book, which runs to nearly 700 pages!

As well as steam lorries, the book also covers early petrol, steam and electric cars — a real find!

Another puzzle

As mentioned earlier, here's another mystery model steam engine on which we're seeking enlightenment.

Dave Marsh from Victoria sent some photos of a model that has been in his family for about 70 years, and it still runs with a little wood fire under the boiler! **Photos 6 and 7** show it to be a com-

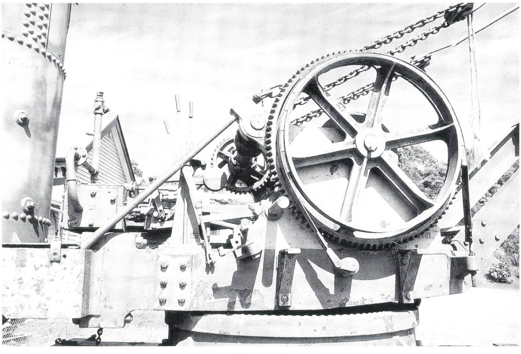
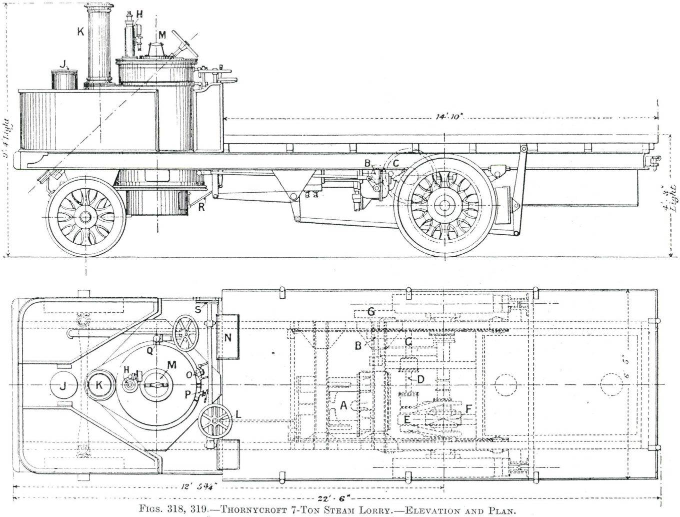


Photo 5



FIGS. 318, 319.—THORNYCROFT 7-TON STEAM LORRY.—ELEVATION AND PLAN.

Figure 2

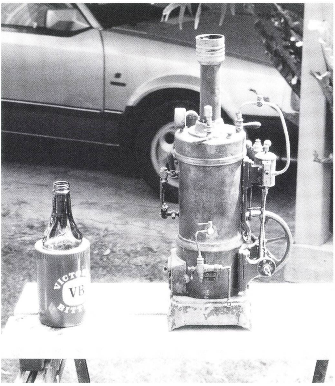


Photo 6

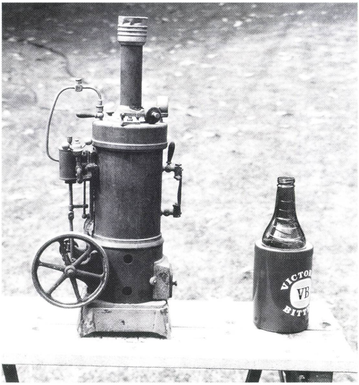


Photo 7

pact vertical engine and boiler assembly with a convenient stubby for scale. It has marked on it "DC Germany", and Dave would be most grateful if anyone could provide more information about the model.

I'm always surprised that this configuration of engine and boiler is not modelled more often — it was widely used in the full size and seems a very neat and convenient setup.

Lots of hot air!

I've made another good friend recently, since Edwyn Jones contacted me to show me his collection of hot air and other models. Arriving at Edwyn's place, I was amazed at the collection of models he's made over the past couple of years.

Having built a simple horizontal steam mill engine, and a hit-and-miss IC engine, Edwyn decided he'd have a go at designing his own hot air engine. Having established a basic set of proportions that seemed to work, he set to and produced a range of engines that all run on the heat of a little spirit burner, but all have different layouts. **Photo 8** shows the range to date — I'll be including more close-ups of them over coming issues.

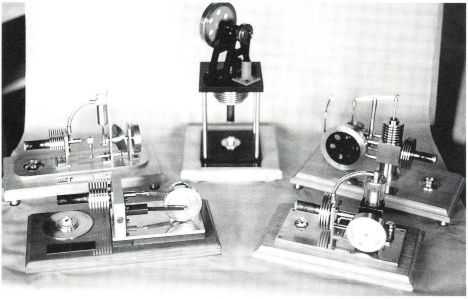


Photo 8

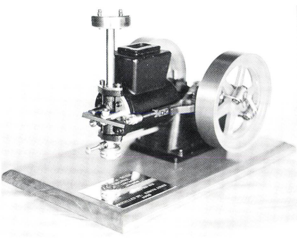


Photo 9

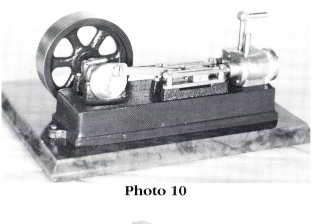


Photo 10

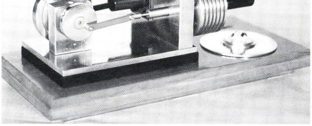


Photo 11

Having been a boilermaker, then an industrial engineer, and finally spending some years teaching basic metalworking skills to the unemployed, Edwyn has expanded his skills to include turning and woodwork. He presents each of his models on a neat timber base complete with engraved nameplate. **Photo 9** is the little hit-and-miss engine, and **photo 10** is the mill engine. **Photo 11** shows the first, basic horizontal hot air engine with its little spirit burner let into the wooden base. The drive cylinder has a bore and stroke of 16 x 12mm, and the displacer cylinder is 16 x 22mm. The flywheel dia is 60mm and it runs up to 1000rpm.

It certainly spun up very quickly when Edwyn demonstrated it for me, well done, mate! Such has been the interest shown in these models that Edwyn is producing kits for them — have a look in the Classified Ads in the last few issues!

Power House Museum booklets

Regular correspondent John Single has sent me an interesting booklet on the Maudsley Beam Engine in Sydney's Power House Museum. Known in full as the Maudsley Sons and Field 16HP Beam Engine, it was built in 1837 and was imported by William Bradley to drive his flour mill and brewery complex near Goulburn, NSW. After almost eighty four years of continuous service it was presented to the museum by William Bartlett who had purchased the brewery in 1874. It is the only one of its kind known to exist in the world, and so is a very valuable relic of the Industrial Revolution.

It appears that this booklet is now out of print, but as it has an excellent potted history of steam power as well as an excellent diagram of the engine, I'd be happy to photocopy it for anyone interested — just send me an SAE via the editorial offices, or email or phone me, and it can be arranged.

There is also an excellent booklet on the Boulton and Watt beam engine available still from the Power House Museum — as the B&W engine is the centrepiece of their display, not surprising.

Beginners steam articles?

A relatively new reader of *AME*, Geoff Sanger from NSW, has asked if we could run some articles on the basics of steam engines for beginners like himself, to explain such things as triple expansion engines, etc. Do any other readers agree that such articles would be of interest? If there's enough interest, I'm sure our editor would be happy to publish some, and I think I have enough material to produce them! Please let the editor or myself know, and if there is sufficient response, we'll see what can be done.

That seems to be enough for now, until next time, happy steaming!

You can email Dave at
sandave@bytesite.com.au
or write to him via the
***AME* office**

Universal Test and Demo Stand for Locomotives — part 2

by Peter Dawes

Drawing for publication from the author's originals by Rex Swensen

Design considerations

1. The minimum wheelbase possible is equal to the diameter of the rollers. The smaller the rollers the shorter the minimum but the smaller the arc of contact with the wheel treads.

2. Resolution of wheelbase adjustment is a function of the adjusting screw pitch (the finer the better) and number of teeth on the sprockets (the more the better, so that a smaller chain pitch makes for a smaller sprocket diameter for any given number of teeth. The catch is that $^{1}/_{4}$" pitch chain and sprockets cost nearly twice as much as standard $^{3}/_{8}$" pitch). Builders could choose a coarser screw pitch or a sprocket with fewer teeth, but not both of these at once or they could end up with insufficient adjustment resolution.

3. All rollers except idlers must be exactly same diameter and be driven at exactly the same speed. The larger the diameter the better given the constraint on minimum W/B.

4. The arrangement used in this design for adjusting the W/B is one that requires very little change in chain length per unit change in W/B so do not change this system without giving it very careful thought. Approximate calculations show that 5" of axle travel (i.e. W/B change) requires less than 10% change in chain length to accommodate it. The shortest chain length occurs when the axle is in the middle of its range. It increases slightly as it moves to either end of its travel.

5. Many dimensions are so closely interrelated that trying to change one may upset something else. Do not modify the design unless you are prepared to follow through and check all related dimensions, and even then some will surely come back to haunt you.

6. All shafts must be mounted on low friction bearings (i.e. ball races) because the numerous changes of direction taken by the chain would impose impossibly large frictional loads on the drive system if sleeve bearings were to be used. I have found that on cold mornings, the drive feels relatively stiff. As the temperature warms up the resistance drops significantly. For lowest resistance the chain should be washed in kerosene (paraffin) or in petrol (gasoline), dried carefully and then re-oiled with low viscosity oil. Oil with a low temperature coefficient of viscosity would be best, and jojoba, sperm whale oil and silicone oils come to mind. However I cannot find figures on their relevant properties. Failing those, sewing machine oil could be used, but this is only necessary when rolling resistance must be kept to an absolute minimum for whatever reason.

The Gates Rubber Co quotes chain drives as having an efficiency of 91-98% when properly installed and maintained, while timing (toothed) belts are consistently as high as 98% (Source: *Belt Preventative Maintenance Manual*). Now timing belts could be used to make this whole machine, but the cost of the pulleys would be astronomical. Alternatively the time taken to make them would be significant, but if you want to make a toothed pulley, for $^{3}/_{8}$" (L) pitch the key dimensions are given in **Appendix 2**.

Builders could reasonably and conservatively assume an efficiency for a chain drive of 95% if used with light oil and the optimal amount of slack. The efficiency of a motor used as a generator is a separate issue and not so easily derived.

7. Variable speed and a reversible drive are desirable for an "active" unit. These are best obtained by a variable voltage ac/dc motor drive with either PWM or phase control. This aspect will only be covered in basic form here.

8. A hand crank is essential for accurate manual setting of valve gear positions. This should be accessible from either side. It takes the form of a removable handle fitted to the centre drive axle. This axle extends $1^{1}/_{4}$" beyond the frame on each side with a diameter of $^{5}/_{8}$". A keyway and/or a $^{3}/_{16}$" roll pin is used to key the handle. The handle itself has a radius of about 3". Any longer and it would foul the base on which the machine rests.

9. An accurate WHEELBASE LENGTH SCALE is a desirable feature, one for each adjustable axle — nice to have but not essential. A W/B indicator is quite simple to make by fastening a pointer to the adjustable axleboxes on one or other side of the machine. It doesn't matter which. An $^{3}/_{4}$" wide groove $^{1}/_{16}$" deep is milled across the top in the exact centre of the axle box. A pointer made from $^{3}/_{4}$" wide x $^{1}/_{16}$" thick flat strip is screwed into this groove with small countersunk screws. It is bent up at a right angle so that it lies close to the face of the 1" square hollow section and on that surface can be fixed or engraved a suitable scale. Two twelve inch rules make excellent scales as long as you accept that the left hand one must be read upside down. The two rulers are affixed to the LH side of the guide frame with their zero ends in contact and exactly at the midpoint of the centre axle.

10. Since the two sides of the stand are connected only by tubular spacers and tie bolts, it is important that all corresponding holes for these and for the axles, be drilled at the beginning with the sides temporarily bolted together.

This is the same way that loco frames are laid out. Manipulating these long frames on the table of the drill press is so awkward that a helper is essential. It is more than doubly difficult when the two sides are bolted together, so make sure you lay out the position of as many holes as possible in the first instance. The only safe way to lay out any "late" holes is by taking accurate measurements from the sides and ends of the two side plates. I had not been able to decide on the motor or its mounting at the time I assembled the machine so I laid out a grid on the outer faces of each plate at the "front" end where any motor would be mounted. I took as reference the end and top edges of the plate. A small area of grid at 1" intervals was created and the cross points centre punched so they wouldn't be lost after painting. I now have a reference in case I have to drill holes that must line up on both sides. Subsequent experience showed that the grid was very useful.

11. The chain tensioning slide restricts the amount of space above it and that will limit how far back the "4th axle roller unit" can go. Therefore it is advantageous to put the slide well back, even though that will mean using more chain.

Points on construction

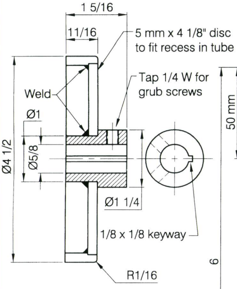
Frame side plates

These are just plain rectangular 3mm plates. Bolt them together for marking out and drilling just like a pair of loco frames. There is a protocol provided for this drilling. There are two groups of holes:-

(1) those to bolt up the slide guides on the LHS and

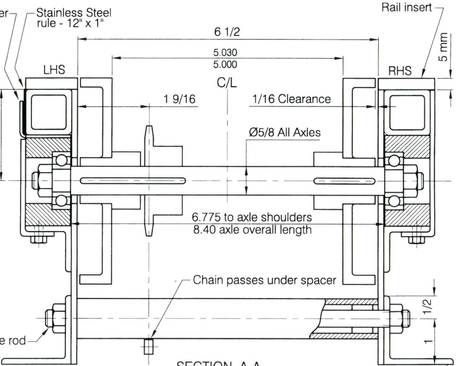
(2) those to bolt the fixed axleboxes for the input/output shaft on both sides. They all start off at $^{1}/_{4}$ inch whether they remain that size or not. They act as pilots for hole sawing, or are opened out to $^{5}/_{16}$" for tapping $^{3}/_{8}$", or are opened out to $^{3}/_{8}$".

Find and mark the centre (25") on both pieces. The centre reference for most laying out is the location of the middle axle. This may or may not be the same as the physical centre of the plates. In my case they are the same, but I am suggesting in the "Conclusions" chapter that the design centre be shifted 1" back of physical centre



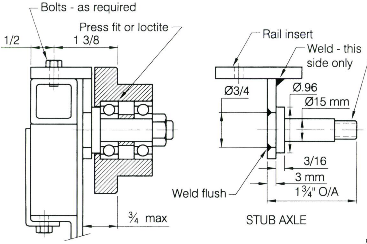
ROLLERS - FABRICATED

Steel - 6 Off



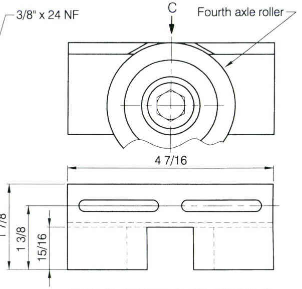
SECTION A-A

THROUGH LEADING OR TRAILING AXLES AND SPACER

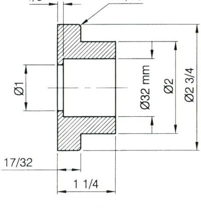


FOURTH AXLE ASSEMBLY AND DETAILS

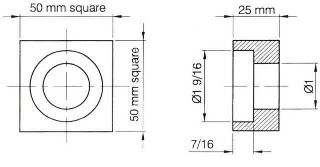
2 Off - all parts, RH and LH pair



VIEW IN DIRECTION OF ARROW C



FOURTH AXLE ROLLER - 2 Off



MIDDLE BEARING - 2 Off

Not to scale

UNIVERSAL TEST AND DEMO STAND FOR LOCOMOTIVES - Sheet 2 to give more length in front. The drawings do not include this modification. This is optional. The centre line is one of the reference points for making the rail inserts.

There are two slots in the plates, a shorter one (4" c/c) at the front and a longer one (5" c/c) at the back. In between them is a plain hole for the fixed centre axle. Cut the holes with the holesaw at each end to define the slots, and also cut out as much intervening material as possible to save on milling. Mill out the waste metal. The dimensions of the slots are not critical. They could be $^3/_4$" wide but not smaller. They provide clearance for the moving axles.

The axlebox guide frames

These consist of an upper 25mm square hollow "rail", a lower 25 x 25mm angle rail, and two short end pieces of 9 x 25 flat joining them 50.2mm apart. The pieces are welded together on a flat welding table with the axleboxes temporarily between them to maintain correct spacing.

Add thin shims to the axleboxes to give the necessary clearance and put a clamp on them at each point. The end-piece of each frame must be drilled and tapped BEFORE welding, since it is difficult to do it afterwards. It is important that they be square to the frame.

Middle axlebox

The middle axlebox on the RHS is "boxed in" in the centre of the guide frame by welding 50.2mm long spacers close up to each side. Don't weld the axle box itself — it must be removable. The middle axlebox on the other side (LHS) is given $^1/_8$" longitudinal clearance, made up of $^1/_{16}$" on each side of exact centre. This is to provide fine adjustment of its position by means of shimming. One spacer on this adjustable axlebox is pre-drilled and tapped $^5/_{16}$"W or similar metric or US) for a short cap-screw that is used to tighten the axlebox up against the shims in its housing. A locknut on the cap-screw prevents loosening. A cap-screw is used because it's easier to turn a bolt with an Allen key than turn a hex head with a spanner in a confined space.

The reason for making the position of one of the axleboxes adjustable is so that it can be set exactly square with the main frame and to match the fixed one on the RHS, just in case they don't come out square.

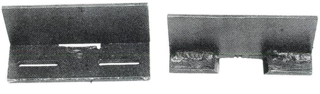
The whole axlebox guide frame assembly is then bolted onto the side plate with the top of the square hollow section FLUSH to the top edge of the plate using $^1/_4$" hex bolts in places where they will not interfere with other parts. This flush mounting is important. It means that when the 5mm thick "rail inserts" are bolted onto it, the rail-head will be level with the rim of the rollers.

Rear idler

Note that the chain drive runs close to the LHS frame and five of the idlers are fixed to this frame plate. The rearmost idler is adjustable horizontally and provides the chain length adjustment.

Front idler/drive shaft

The "front" idler deserves special comment. It is fixed and mounted differently from the others. Its shaft extends from one side to the other of the machine and out beyond the RHS. It is one of the two optional main drive input/output shafts and because of this, is made removable without requiring dismantling of the whole machine. Its shaft slides freely in the $^5/_8$" bearings (RLS-5). Its axleboxes are the same 2" square ones except they need only be $^5/_8$" thick. They are bolted to the INSIDE of the side frame with four small screws at the corners. The bearing is trapped in the axlebox on the inside of the frame plate in contrast to the other axleboxes which trap their bearings outside of the frame plate. The axle is locked axially in the bearing on the outside by a cap-screw and thick washer tapped into the LHS end. On the inside it is held in the bearing by a spacer tube between the bearing inner ring and the 22T sprocket. When the latter is locked to the shaft with a $^5/_{16}$" square head hardened set-screw, the shaft is held axially.


"Body" of 4th axle assemblies

This shaft is made with spare keyways along the middle and on the outer end for fixing any drive pulleys or sprockets as required. In my machine it carries the 48T sprocket for the 4:1 reduction stage.

The 4:1 speed reduction shaft

This is a optional addition. It is a half inch diameter shaft to accommodate the 12T sprocket which drives a 48T sprocket on the preceding shaft. It is fitted in the same way as that shaft so it can be removed without dismantling the whole stand. Its axleboxes are also inboard. It requires RLS-4 bearings which are expensive! But they are a better proposition than having to machine a special shaft.

The "penalty", if you can call it that, for adding the 4:1 reduction stage is that the 48T sprocket will project below the bottom of the machine, implying that the machine needs to be either raised off the bench or sit on an open top table. If this is not a problem then the ratio can even be increased to as much as 5.5. The limit of about 8" diameter (about 66T) for the driven sprocket is set by the clearance from the adjacent axles and spacer tubes, and also the line of the rail head at the top.

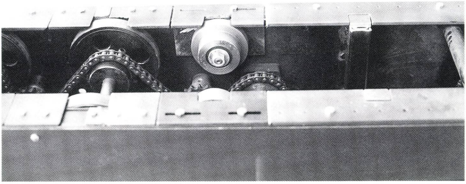
There is no provision for an adjustable chain tensioner on this 4:1 stage. I adjusted the chain length on test, making use of the hints and formula in the appendix. I also "fine- tuned" it by adjusting the teeth on the small sprocket down to 11 — which is possible because the exact ratio here is not important. Combining all those methods I got exactly the right tension.

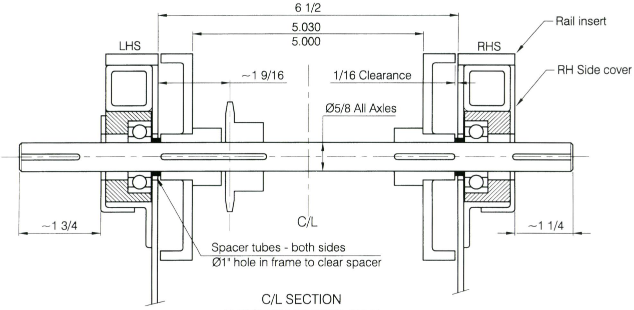
Resistance to being driven by the loco increases significantly with the addition of stages of belt or chain reduction. This is only to be expected but it needs to be considered in dynamometry.

Fourth axle assembly

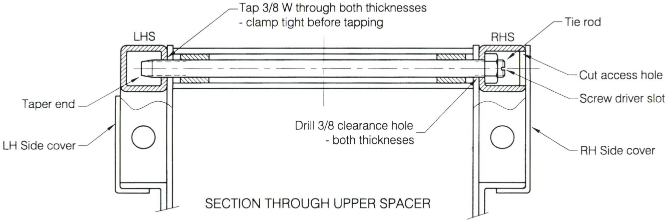
These must exist as a pair but the rollers don't have to be a specific size or even matched since they are not linked together nor driven. They consist of three main parts, a body, a roller, and a stub axle. The body consists of a "top" made from a piece of 50 x 5mm rail insert material welded at a right angle to a vertical "side" piece of 50 x 3mm. The top has a pair of slotted holes to bolt onto the square hollow section of the axle box guide frames at the top of the stand. So the top plate becomes the new rail insert. The same row of holes used for attaching rail inserts is used to attach the 4th axle assembly.

The roller itself is machined from solid 3" (75mm) bar stock. It contains a pair of 6201s separated by a 3mm thick washer. Construction is very similar to the sprocket idlers. One race should be a tight fit or Loctited. The roller is nominally $2^3/_4$" (70mm) diameter and while it is best made from solid stock, the machining is easier for a small lathe if it is fabricated from tube

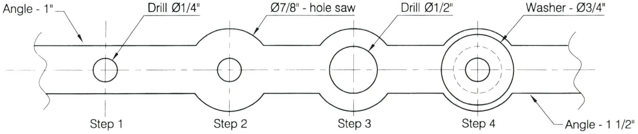

Two 4th axle assemblies installed



C/L SECTION
THROUGH CENTRE AXLE



SECTION THROUGH UPPER SPACER



PROCEDURE FOR MAKING HOLES FOR IDLER STUB AXLES - Shown actual size

Step 1 Drill Ø1/4" - LHS plate only, with foot and axle box yoke frame assembly bolted on

Step 2 Cut hole Ø7/8" through 1" and 1 1/2" angles but NOT into frame plate - using hole saw

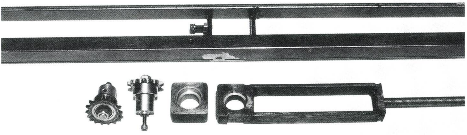
Step 3 Enlarge Ø1/4" hole to Ø1/2"

Step 4 Provide Ø3/4" x 1/8" washer with Ø1/4" hole and bolt stub axle into Ø1/2" hole with 1/4" x 3/4" W cap screw on the outside

Note: Refer to Sheet 4 for details of idler stub axles

Not to scale

UNIVERSAL TEST AND DEMO STAND FOR LOCOMOTIVES - Sheet 3



Part of axlebox guide frame plus 2 idlers, plus centre axlebox and axlebox yoke assembly

and disc similar to the main rollers. It should have as large a diameter as possible, but size is limited by the need to clear the top of the fixed axleboxes on the inside of the frames at the front. At the rear there is even less room over the chain adjusting slide.

The roller runs on the third component — a stub axle which is welded flush into the "side" part of the body.

The length of the whole 4th axle assembly with its rail, is always made "one minimum wheelbase" length, or 4.5 inches, with the stub axle in the centre. There is no point in making it smaller since this is the minimum design wheelbase anyway.

While the left and right 4th axle assemblies could be joined by a common shaft, I don't think this would achieve much and would only make it harder to build and install.

The 4th axle rollers can be located at the front or at the rear of the machine, wherever they will fit. It is just a matter of removing rail inserts and providing the $^{3}/_{16}$" tapped holes to bolt them down.

Now we have seen that most of the work on the chain drive assembly is done on the left hand side plate. The idler stub shafts and sprockets are a key component of this drive.

Idler sprockets

These are bored for two ball races mounted side by side, separated by a 3mm thick spacing washer. The idler is mounted on a stub arbor which bolts to the main frame with a single axial $^{3}/_{4}$" x $^{1}/_{4}$"W cap screw. A $^{1}/_{2}$" diameter locating spigot on the stub arbor body locates in a $^{1}/_{2}$" hole in the frame plate to fix its position. These half inch holes should have been defined when the two plates were bolted together right at the beginning of construction, although they are only actually used on the LHS.

Axleboxes

The centre pair are more or less fixed. The two outer pairs slide in the "axlebox guide frame". The latter functions like loco horns except that movement is constrained to be horizontal rather than vertical. Note that there is no open bottom end of the "horn" as in a loco, so completely assembled axles must be prepared on the bench then inserted between the frame side plates loosened for the occasion. (The exception is the two drive input axles which can be inserted from the RHS without dismantling the frame.)

The main axleboxes themselves are 25mm thick sections sawn or parted off from solid 50mm square bar stock. The two axleboxes for the front fixed axle can be $^{5}/_{8}$" thick since they are bolted independently to the frame side plates internally.

It might seem like courting disaster to part off square stock such as this but in fact it is the best way. In spite of the interrupted cut on the corners, parting yields truer ends and requires less finish-turning. A gooseneck or springback parting tool is essential of course, as I described in an earlier article on parting off. Cutting oil is also absolutely essential to the operation so do not try to part off without it.

Bandsawing is another way to make the axleboxes but unless the saw blade runs unusually true, the ends will need a fair bit of machining to square them up and this must be allowed for. My saw wasn't cutting accurately enough and parting proved ideal anyway. A power hacksaw would also do the job quite efficiently.

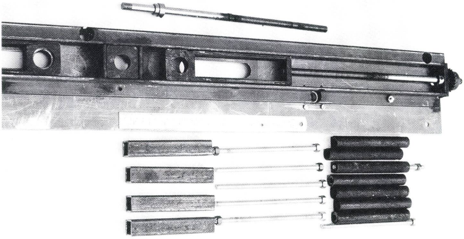
The axleboxes should be bored for an easy push fit with the bearings. Do not make the bearings tight or fix them with Loctite.

W/B ADJUSTING SCREWS — used to adjust the w/b, are made by welding together about $7^{1}/_{2}$" of $^{1}/_{2}$" NF screw (because it's expensive!) to about $7^{1}/_{2}$" of $^{1}/_{2}$" BMS round. To join them, put both pieces into the vee of a piece of 1" x 1" angle iron and clamp them with the ends separated about $^{1}/_{32}$". Weld as much of the ends together as visible. Then move the rod out over the end of the angle and carefully weld the other side of the join. You should obtain a nearly straight rod. Any residual bend can be hammered straight. An alternative way to make the join is to machine a short $^{1}/_{4}$" diameter spigot on the screwed rod and drill a matching hole in the $^{3}/_{8}$" round. Clean them up and silver solder while holding the parts true.

The third alternative is to lathe-cut the thread. Each has a thread about 7" long, and since four pieces are required there is a lot of screw-cutting. Free cutting steel is recommended in this case. Machine the thread to about 3/4 of full depth then run the die over it. Do not try to cut the thread with a die from scratch because the thread will wander, and on a long shaft the result will be guaranteed — disaster.

Fit the axlebox "yoke" assembly with its screw. Mark the position for a collar that is to be pinned or locked on the shaft. With $^{5}/_{8}$" of screw thread on the end, this collar will be about $2^{3}/_{4}$" from the end. Cut a $^{1}/_{8}$" keyway in the end of the shaft for a sprocket and handwheel (if one is fitted to the shaft). You can fix the handwheel with a grub screw or optionally include it with the keyway. Note that grub screws must be used with a dimpled shaft to properly lock. The last $^{1}/_{2}$" of the shaft is for a lathe-cut screw thread (e.g. $^{1}/_{2}$"NF x 20 tpi). A nut on this thread then adjusts the end play in the bearing against the collar pinned on the other side and takes the final thrust imparted to the rollers by the power of the loco. The nut may need to be Loctited or otherwise fixed. It is subject to considerable force when the loco is driving the machine against a load.

The $^{1}/_{4}$" pitch sprockets are keyed to the $^{1}/_{2}$" shaft and a chain drive links the two sides of the UTS together. You will find that the chain length required is very approximately $21^{1}/_{4}$" if 23T sprockets are used. A few calculations show that the only way to make it fit without an idler is to control the centre distance precisely. I estimate the centre distance would have to be 7.72 inches — not 7.75 nor 7.70". I don't think that this is a reasonable expectation, so plan for an idler to tension the chain. In



Outside frame, 12" rule, 7 x tie rods and spacers, axlebox adjusting shaft installed any case, it is easier to shift teeth on a loose chain than a tight one. Tensioning can be by a spring loaded nylon rubbing block or better, by a small sprocket on a bracket mounted between the two stanchion sockets. I chose to use 15T x $^1/_4$" pitch sprockets as the tensioners and these cost me about $11 each. The idler sprockets come with a $^1/_4$" hole so it runs directly on a $^1/_4$" bolt, since wear is not a problem. Drill one or more $^1/_4$" tommy bar holes in the hubs of the 23T sprockets. It makes them easier to hold while tightening the end nut.

Spacer tubes

These act as "stretchers" between the main side frames. They are finished exactly $6^1/_2$" long. The ends are turned square and true. Drill the ends $^5/_8$" diameter for a depth of about half an inch and drive a short plug into each end of each piece leaving it somewhat below the surface. If the plug is loose, push it down about $^1/_4$" into the end and tack weld it inside the tube. Put the tube back in the lathe and centre drill the plug. Now drill right through the plug $^3/_8$".

This procedure ensures that the tubes will centre themselves on the tie rods when assembled. This is an important part of aligning the two sides. Any tilting of the tubes can result in problems. One special advantage of using this method of spacer-plus-tie-bolt to join the sides is that the design can be easily modified to a different track gauge. It is also simpler to construct and to dismantle. But the spacers must be properly made for the method to succeed and final assembly must be on a flat bench or it could "take up" any error on the bench on which it is assembled.

The top three tie rods should have one end lightly tapered to find the hole and the other end slotted for a screwdriver.

I had to make a late decision to change the design of the two bottom middle spacers for reasons that follow.

Some special precautions

1. It is important to locate the spacers where they will not interfere with the chain drive or with the moving axleboxes. In the case of the two centre ones in the bottom row, there are limited places for them. The best is on each side of centre over the returning chain. Follow the drawing. The returning chain may need some support to reduce the tension in a long unsupported length. If so use nylon rubbing blocks under it.

The four end spacers can go close to the corners for maximum control but must be inside the stanchion sockets and the top ones are located preferably about $2^1/_2$" from the ends to give enough clearance to get one's fingers around them because they make excellent CARRYING HANDLES for the machine. This is well away from the sprockets so there is no problem with their position otherwise.

2. The top middle spacer must go to one or other side of the centre roller (it doesn't matter which) but not so far that it encroaches on the movement of the adjacent roller. There is only a small triangular window available to it.

3. Special note re top spacers: On the LHS frame, the three top spacers are tapped into holes passing through the side frame plate and the adjacent side of the 25mm square tube. They do NOT penetrate the outer side of the square tube. This conceals the ends of the tie rods. So when tapping the $^3/_8$" hole in these parts, clamp them tightly together, otherwise the threads in each layer will ensure that they remain separated the same amount as they were during the tapping.

The next step is to drill corresponding holes on the RHS frame right through $^1/_4$" — but only to start with. The $^1/_4$" hole is the pilot required for using the hole saw. So open the hole in the OUTSIDE wall to $^3/_4$". That done, and only then, the inside hole is opened out further to $^3/_8$" for the tie rod. Now the three nuts in the upper row will be recessed inside the square tube, and this is also why a tubular spanner is needed. The "side cover" covers these holes later. There are no nuts on the LHS so those ends are already concealed. The screwdriver slot in one end of the tie rods is for driving the tie rod into the concealed hole in the LHS frame.

4. Another precaution is to put the set-screws in the roller and sprocket hubs sufficiently distant from the chain so that the links cannot foul them.

5. Make the small-chain loose enough that with the tensioner relaxed the chain will come right off one of the 23T sprockets. This is much easier than having to break open and rejoin the chain just to shift it round by a few teeth on the sprocket when adjusting the roller shafts for parallelism.

6. Do not be tempted to change the centre height of either "end" sprocket. This will cause the returning chain to foul the chain on the idlers or hang too low.

7. Do not skimp on the fixing of the handwheel on the $^3/_8$" chain tensioning shaft. All the loco power passes via the chain to pull on the rear end-idler and thus on the chain tensioning system. This is why a cap screw has been specified in the end of the shaft to hold the handwheel axially (see detailed drawing).

8. Do initial assembling with grub screws. Don't use roll pins until final assembly because they are difficult to remove in situ and even harder to replace. In fact I ended up using only set screws.

Chain-tensioning slide

This little assembly is easier to draw than describe. Start by making a stub arbor, but with a body 3mm shorter than the others to allow for the thickness of the slide plate to which it is welded. And instead of a short half inch diameter shoulder, it has a shoulder about $^5/_8$" diameter 2.8mm long to fit into a matching hole in the slide. The slide is a piece of 50 x 3mm flat 70mm long. The two parts are welded on the underside and the weld ground flat. When making parts like this always heavily bevel the adjacent edges so as to provide room for the weld. Otherwise, when you grind it flat again, most of the weld is lost.

Make two side pieces to form the guides for the slide. These are built up from 16 x 3mm and 25 x 4mm flat stock the same length as the 50mm wide flat. They are lightly welded together as shown. That is only to make it easier to drill the holes to bolt them to the side frames. Position the slide plate in the same line as the other idlers (the axis MUST be horizontal) and put a guide up against its edge. Drill, tap and screw up one of the three holes before doing the other two. The lower set of three holes is bolted on with $^3/_{16}$" hex head bolts. These holes go right through the frame plate and the angle iron. It is best to counterbore the holes in the angle $^3/_4$" so that removing it does not involve removing the slide plate and its guides. Then position the other guide in light contact with the edge of the slide plate and drill its fastening holes. If the upper set of screws encroach into the channel in which the axlebox assembly slides, their holes must be countersunk, and countersunk head screws used. These screws have only 3mm of thread to hold them so tap and tighten with care. Fit the other guide up close to the slide plate and drill and tap its holes similarly.

The $^3/_8$"W screw thread tapped into the body of the stub arbor for the tensioning shaft MUST be parallel to the axis of the slide and to the axis of the whole machine.

Keyways

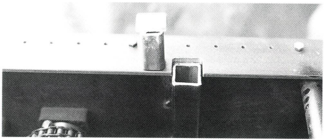
Mill all the keyways in the half inch and $^5/_8$" inch shafts with an $^1/_8$" end mill. From my article "Keyway Depths" the correct depth of cut for $^5/_8$" shafts measuring from the surface, is approximately 0.069", or 0.074" if including clearance, and for $^1/_2$" shafts 0.070" (.075" if including clearance).

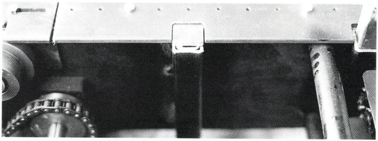
Handwheels

The W/B adjusting screws are turned by a handwheel on the end of the shaft. My handwheels are simple wheels made from a $2^1/_2$" disc of 3mm plate cut with a $2^3/_4$" hole saw, then welded to a $^1/_2$" long section of $2^1/_2$" diameter pipe — the same way the rollers are fabricated. A hub is silver soldered in the centre with a boss that fits into a matching hole in the disc to locate it during the soldering. The outer rim is trued and then knurled. The handwheel is keyed with a $^1/_8$" square key and/or fixed with a grub screw. It is also held on with the nut on the end of the shaft but the primary purpose of the nut is to adjust end-play in the bearing and to take end thrust transmitted from the axleboxes.

A collar is roll-pinned or locked with a grub screw onto the adjusting shaft just inside the bearing to act as the stop in the other direction.

NB: If using roll pins to fix the collar, remember to drill a $^1/_2$" hole in both side frame plates just inside the end piece of the frame and in line with the bearing. Drill it where the roll pin would be in the collar. This allows the pin to be driven out if nec-


Socket plug — note cap to fill gap in rail


View of socket plug in lace

essary and/or to clear a grub screw if the latter should project too far and foul the plate. However, with dimpling, the grub screw should finish nearly flush.

The main chain tension is adjusted by a simple $\frac{3}{8}$" threaded rod running in a hole drilled in the stanchion socket on the rear left corner. There is no formal bearing. The threaded part should be about 3" long and $1\frac{1}{2}$" of plain shaft should project outside of the stanchion so that it stands well clear of the chain assembly. That makes the whole shaft about $11\frac{1}{2}$" long. The thread ($\frac{3}{8}$"W) should be lathe cut then finished to size and form with a die. A knurled knob can be fitted to the end of the shaft. See drawing for detail of how the cap screw in the end is fitted.

Idler sprocket stub shafts

These warrant specific comment. My 15T sprockets are 19mm thick and two type 6000 bearings side by side in them leave 3 mm to be made up. This space was filled by using a slug from one of the holes cut in the 3mm main frames with the hole saw — as a spacing washer. These slugs are about $\frac{11}{16}$" in diameter. So five slugs were drilled out 10mm to make spacers then linished flat and smooth.

The holes in the sprockets were bored for a press fit for the bearings. ONE bearing was pressed into place then a 3mm washer added. The second bearing was then pressed lightly up to it. If the bearings are not tight then the inner one MUST be Loctited into the sprocket bore.

The bearing and sprocket assembly is held on the 10mm stub shaft by a fine thread nut tightened up on the inner rings of both bearings (use $\frac{3}{8}$" NF or BSF or 1mm pitch metric).

Drill a $\frac{1}{4}$" cross hole through the body of all stub shafts for a tommy bar. Drill and tap a $\frac{1}{4}$"W hole in the end for a cap-screw to fix the stub shaft to the side frame.

In the case of the chain adjuster sprocket at the rear end, the same arrangement is used except that this sprocket happens to be 22mm wide. Allow for the extra thickness so that its teeth line up with the others. The reason we must use a larger one here is that we want to keep its centre as close to the middle (3" high) as possible in order to maximise the diameter of any large sprocket or pulley on the shaft for maximum speed reduction in the primary drive. But at the same time the bottom of the sprocket must be below the line of the four idlers or this "returning" chain will foul the chain passing around in the opposite direction. It introduces a 22:20 step-up into the driven but this is not important.

"Rail inserts"

These are just flat bars, but making and fitting them is a tedious job taking a number of days. Without a mitre abrasive saw it would be a lot of hard work as well. The worst part is the chisel edge on the ends where they butt up to a roller. Make the inserts only after the rollers are fitted, as the exact position and the width of the "gap" (see drawing) varies according to the final diameter of the rollers, how high the rim comes above the top of the frame, and the exact angle you cut the chisel edge. I found that a gap of $1\frac{3}{4}$" (i.e. $\frac{7}{8}$" each side of centre) was appropriate for my machine.

The rollers should finish more or less flush with the top of the insert but there is no reason why they cannot be proud by a millimetre.

There are a number of ways to cut that chisel edge. One is to set a sawing machine to the complementary angle of its scale. Another is to fly-cut the curve in the mill. That would be a slow job but it would certainly produce the neatest job. Fly cutting on the lathe saddle would probably not be possible as the radius required is larger than the clearance on the cross slide of most hobby lathes.

To find the ideal shape of the chisel edge put some rail alongside the roller rim and scribe the outline on the edge. Then if using the 30 degree approximate angle, draw a line tangent to the arc at 30 degrees on the edge, or if using a 45 degree cut, draw the tangent at 45 degrees. This gives the required gap. The end of the chisel edge should not be sharp and there should be a small bevel on the TOP edge to ease the "hop-on" for the loco wheel going from roller to rail.

Notches have to be cut in the fixed inserts at the ends where there are stanchion sockets. The loco can always be helped across these gaps but it is much better to cut a small piece to fill the gap, and weld it like a "cap" to the top of the stanchion post so it lies flush and in line with the rail when the stanchion is down. The cap also stops the stanchion falling right through the socket. They are simply lifted up when required.

There is another arrangement that avoids notching the rail inserts. That is to space them $\frac{3}{4}$" inside of the frame plates so they clear the inner edge of the rail. That requires an extra $\frac{3}{4}$" thick spacer and a triangular brace to provide strengthening. They can be bolted or welded to the frame plate.

That arrangement puts the sockets $3\frac{1}{2}$" apart. Builders can choose which spacing is the best for them.

Make the fixed rail inserts at the ends long enough to overhang the handwheels at the end of the machine, especially if proposing to add an extension to carry a tender. Save any short scraps of bar. They may come in useful for making a special set of inserts.

Side cover plates

The LHS plate is a simple angle of 1.6mm steel ($\frac{1}{16}$") with a short side $\frac{5}{8}$" (inside measurement) and a long side of 1". Make sure there will be sufficient clearance at the top edge for the wheelbase indicating pointer to pass out along it.

The RHS plate can be the same size, but better is $\frac{5}{8}$" by $3\frac{1}{8}$" so that the long side covers the whole of the axlebox guide frame including the $\frac{3}{4}$" diameter access holes for the top tie bolts. There are no pointers requiring clearance this side.

End cover plates

These are cut and bent from 24G (.028") galvanised iron sheet or half-hard aluminium, as per drawing. The holes are best punched out with a hole punch but the hole saw will do nearly as well. They are attached to the end of the frame via tapped holes and $\frac{3}{16}$" nickel plated RH machine screws. Builders should adjust these to fit their machine.

The front end cover has two holes — for the shafts of the two w/b adjusting screws. The rear cover has an extra hole for the chain tensioning shaft.

A top cover

To finish off the UTS, make an optional light-weight lid from iron, aluminium, hardboard or plywood. It should cover the whole of the top including any rail extensions used for joining to another stand. With the stanchion posts lowered and the cross-beams removed, the top of the UTS presents an essentially flat surface except for any handles. Its purpose is for neatness and to keep dust and foreign matter out when the machine is not in use, the chain being the main worry.

A low cost design is $\frac{1}{4}$" (6mm) 3 ply framed all round by "2 x 1", glued and screwed. A pair of plated diecast handles ($3) provide the means to lift it off (see **photo**).

To be continued ...

Low Voltage Lights for the Workshop

by David Dunnett

When I acquired my Myford ML7 lathe it was located in an area of the workshop/garage that was a little short on light. To remedy this I constructed a makeshift light from a baked bean tin, some wood and a 60 watt 240 volt lamp. This state of affairs lasted until one day the contraption fell onto the chuck and although this was stationary at the time it gave me quite a fright and focused my thoughts on a safer low voltage light using the 'dichroic' tungsten halogen lights. Having priced these desirable items in a catalogue I decided that there had to be a cheaper alternative better suited to my needs, hence the following story.

The basic ingredients were purchased from 'Big W' and consist of a Kambrook® eyeball low voltage downlight cat KHLE213-1 and a Lightstyle® swing arm desk lamp. These cost $31.32 and $19.47 respectively. See **photo 1**. The items that I chose are white as they are both available in that colour. The other purchases were a 2m length of figure 8 twin cable, as used on table lamps, to replace the cable on the swing arm lamp and two connectors — get smaller ones if possible.

Please keep all the boxes and packing until you have completed the conversion as the picture on the swing arm lamp may come in very handy for re-assembling the arm. So you have been warned!

Construction began by checking and testing both purchases for all parts and operation. The next thing to do was to remove the 240 volt lamp holder from the swing arm lamp. To do this, insert a large Phillips head screw driver through the hole in the back of the lamp housing and unscrew the plastic securing screw. Then remove the snap-in cable clamp. This was achieved by applying pressure to the inside with a large flat bladed screw driver and pressing the clamp out and removing it from the cable. Put the screw and clamp to one side for reuse later. Pull the lamp holder out of the housing and disassemble, it clips together and you should have no trouble here removing the black back piece and the front skirt with a suitable screwdriver. The wires are a push fit in the lamp holder so just pull them out. Remove the two pieces of clear tubing and the piece of black spaghetti and put in a safe place.

Perhaps I should digress a little and explain the choice of the halogen light source. This type of lamp produces a high intensity light from a very compact source. The 'halogen" cycle requires a high temperature to operate and if I remember my lighting studies correctly the temperature around the filament of the lamp is in the vicinity of 400°C. Hence the use of the high temperature sleeving and wires into the lamp.

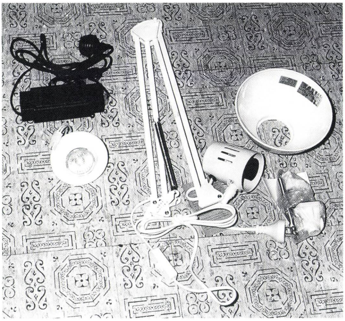


Photo 1

Back to the construction — take the eyeball lamp from the package and carefully remove the eyeball from the surround by twisting the securing clips sideways. Cut off the connector leaving the wires as long as possible. Take the bayonet fitting previously removed from the swing arm lamp and remove the contacts from the bayonet socket by gripping with a pair of long nose pliers and just pulling. Open the outer holes of the contact recesses to 3mm and the two holes outside the contact recesses to 4mm. This will break the material surrounding the holes on the back of the bayonet holder but this is OK as I cut it and a bit more of the adjacent plastic away with a Stanley knife to allow the $^1/_8$"W nuts to seat.

Back to the eyeball and carefully remove the lamp and put to one side. There are two round holes adjacent to the lamp holder and I drilled them out to 3mm. In my collection of wrong size screws I found two 75mm x $^1/_8$" Whit. csk steel screws and four nuts. Refit the skirt to the bayonet socket, then feed the wires from the eyeball through the holes in the bayonet contact recesses and insert the two $^1/_8$" screws through the enlarged holes in the eyeball and through the 4mm holes in the bayonet, fit the nuts and centralise the bayonet socket on the eyeball and tighten the screws, fit the locknuts and cut the screws to length cleaning up the ends with a file taking care not to damage the insulation on the wires. Pass the wires through the rectangular hole in the top of the bayonet socket and snap into place. The completed assembly is shown in **photo 2**.

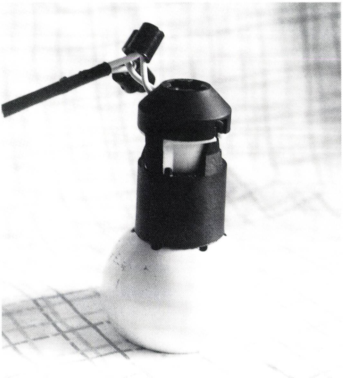


Photo 2

Slide the piece of spaghetti over the figure 8 flex, separate the cores for about 40mm, strip the end of each core for about 15mm, do the same with the wires on the eyeball assembly. Connect the flex to the eyeball wires, twist together and double over, fit a connector to each wire making certain that the bare wires are well

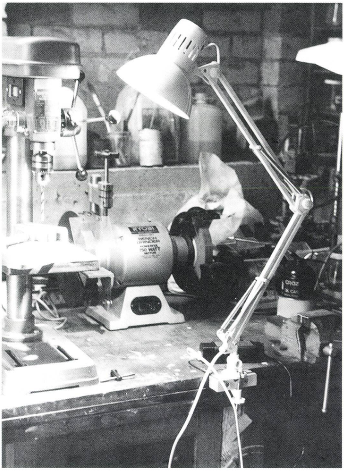


Photo 3

inside the connector and tighten the connector screws. slide the spaghetti as close as possible to the connectors. For the next step I found that it was easier to handle the fitting of the eyeball/bayonet assembly to the lamp if the reflector assembly was removed from the arm. Accordingly I removed the screw holding the reflector to the arm.

Insert the plastic screw back into the bracket inside the reflector, then thread the end of the figure 8 flex through the hole in the reflector, pull the eyeball assembly into the reflector and secure with the plastic screw. Refit the wiring clamp and voila that finishes that. It will be necessary to remove some material from the wiring clamp insert so that it will fit. I cut the material away with a Stanley knife and used the flat blade of a large screwdriver to push everything together.

From previous experience I found out that whilst the original wiring appeared to be suitable the in-line switch was not. The reason is that on 240 volts using a 60 watt lamp the current is 0.25 amps. However at 12 volts the current, using the 50 watt lamp included in the kit, is 4.2 amps and after a couple of hours use the switch melts internally. Of course the easiest way out is to replace the switch with one having a current rating greater than 5 amps to be on the safe side. But I prefer to replace the wiring so that I do not leave the transformer switched on accidentally as when converted for 12 volt operation, the switch is on the output side of the transformer if the original wiring is used. The other alternative is to cut the switch our and join the wires with connectors which is not very neat.

The next step is to rewire the arm and I decided that the easiest way would be to disassemble the entire arm. This was done carefully, laying out all the parts on the floor as I took them apart. The original wiring can be removed as you take the arm to pieces. All that is required then is to thread the fig. 8 flex through the arms leaving loops at the middle and reflector end and re-assemble the arm and lamp, reconnect at the transformer and your low voltage light is ready to use. See **photo 3**.

Australian Model Engineering

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#68	Sept-Oct	1996	$7.50
#69	Nov-Dec	1996	$7.50
#70	Jan-Feb	1997	$7.50
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#80	Sept-Oct	1998	$7.50
#81	Nov-Dec	1998	$7.50
#82	Jan-Feb	1999	$7.50
#83	March-April	1999	$7.50
#84	May-June	1999	$7.50
#85	July-August	1999	$7.50
#86	Sept-Oct	1999	$7.50
#87	Nov-Dec	1999	$7.50
#88	Jan-Feb	2000	$7.50
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#91	July-August	2000	$7.50
#92	Sept-Oct	2000	$7.50
#93	Nov-Dec	2000	$7.50
#94	Jan-Feb	2001	$7.50
#95	March-April	2001	$7.50
#96	May-June	2001	$7.50
#97	July-August	2001	$7.50
#98	Sept-Oct	2001	$7.50
#99	Nov-Dec	2001	$7.50
#100	Jan-Feb	2002	$7.90
#101	March-April	2002	$7.90
#102	May-June	2002	$7.90
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#104	Sept-Oct	2002	$7.90
#105	Nov- Dec	2002	$7.90

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Blue Mountains Railway Society

Invitation Run — August 2002

by John Cummings

Saturday August 31 dawned to another fine day which was excellent for the members of the Blue Mountains Railway Society, who had been busy since the beginning of the year re-roofing the station, refurbishing the canteen, preparing the grounds and track at Wascoe Siding for the Interclub Run.

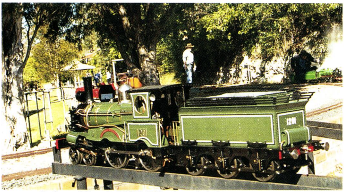
Morning tea time saw our visitors congregating at the steaming bay or canteen with a cup of tea or coffee in hand, talking to new arrivals and old friends. We believe the waterfall and pond (with fish in it) created a lot of envy among the visitors who came from as far north as Timbertown, Wauchope, Orange in the west and Illawarra Live Steamers in the south. In all 9 clubs were represented by 120 visitors and 25 locomotives. Greg Bird of the Orange club won the Blue Mountains Railway Society Trophy with his RU wheat wagon.

The members of the BMRS would like to thank all of those visitors who came for making it a successful weekend.

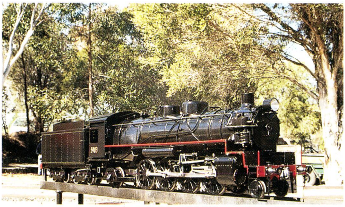
Roger Kershaw and Greg Bird with a scale goods train Photo: J Auld

Water runs down the rock face and into the pond Photo: G Dyson

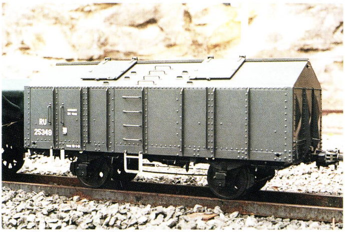
Robert Smithers waits for the Huntleys to pass Photo: G Dyson



Robert Oliver's NSW Z12 class 4-4-0 Photo: Graham Dyson



Robert Smithers' 5903 Photo: Graham Dyson



Greg Bird's trophy winning RU wheat wagon Photo: Jim Auld

Col Hale takes his petrol-electric 73 class for a run Photo: J Auld

Melbourne Society of Model & Experimental Engineers

6th Model Engineering Exhibition

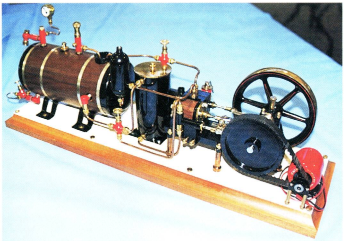
Story and photos by David Proctor

The Model Engineering Exhibition staged by the members of the MSMEE every two years is always well worth attending, and this year's effort was no exception. In fact I believe it was the biggest and best yet. Once again it was held in the Engineering Halls at Monash University, and it was apparent from the activity in the hall when we arrived on Friday afternoon that a great weekend was in store. The reason for arriving then was to set up the *AME* stand which was ably driven by *AME Retail's* John Oliver over the weekend with some assistance from myself between getting material for this article.

When the exhibition doors opened on Saturday morning it was fairly quiet for the first hour and then the number of people coming in just kept on increasing, resulting in a good, even flow of people all weekend. The attendance was good but without the frantic rush periods sometimes experienced at these type of shows. During the weekend I also had the opportunity to catch up with some of *AME*'s contributors from over the years and it was a pleasant surprise to see Peter Anderson from Wellington (NZ) walk in through the door and later in the day Greg Burrows from Auckland whom I had not seen for over 20 years. I think the social aspect of these occasions is almost as much fun as viewing the varied and excellent exhibits.

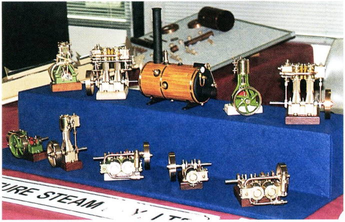
Overall, the exhibition was a very well run affair and congratulations are due to Robert Jones, Ian Stewart and the rest of their team. It is not my intention to give a blow by blow description of the exhibition or to mention everyone who was there, but rather to let the following pictures tell some of the story.

Allan Tregea placed his Gauge 1 Philadelphia *and an interesting scratchbuilt wagon on the SLSV stand.*



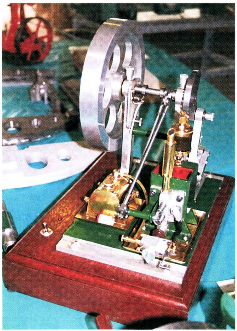
This mill engine and generator is by Maxwell Hemmens of York

This beautiful little boiler is the latest item in the ever growing range of products offered by Miniature Steam Pty Ltd

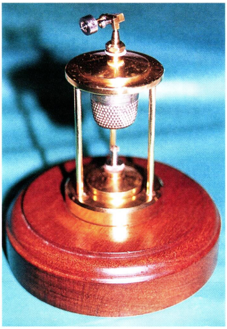


Some of the completed models on the Miniature Steam stand. They also displayed several of kits which include outstanding castings.

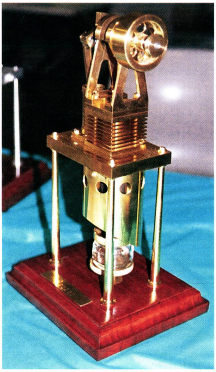
The Resolve *was one of many very impressive boats which were displayed on the Surrey Park Model Boat club stand*



This Atkinson Cycle petrol engine is one of many interesting and well executed models displayed by Bryant Albinson of the host club

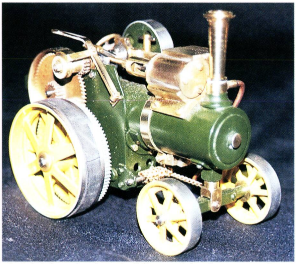


Another of Bryant Albinson's creations is this "Thimble" steam power plant. The boiler is a thimble, bore and stroke are both $^1/_{16}$ inch!

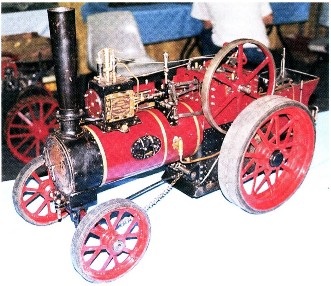


Also by Bryant is this Stirling Hot Air engine

An impressive line-up of boats. The Surrey Park Model Boat Club meet every Sunday morning at the lake at the back of the Surrey Park Sporting Complex, corner of Canterbury & Elgar Roads, Box Hill. (Sec. PO Box 166, Bulleen 3105)

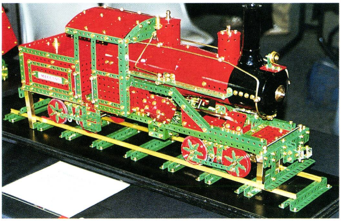


Leigh Adams has been building models of an outstanding quality and finish for many years. He now produces this little working $^3/_8$" to the foot scale traction engine, with a bore and stroke of $^5/_{16}$" which runs on air or steam. You can contact him at The Reedy Creek Steam Co, PO Box 654, Mudgeeraba Qld 4213. Mobile 0408 966 372.



This 2" Marshall belongs to Dave Smith of SLSV, Moorabbin

These battleships mean business! The Victorian Battle Squadron (part of the Australian Battle Group) build warships to a scale of 1:144 (1in = 12ft) which fire CO2 propelled cannons and are easily repaired after being sunk. For more info on this popular hobby/sport contact Noel Brain (03)9818 7969 or visit www.ausbg.org on the internet.



A very creditable looking Heisler was just one of many interesting working items on the Melbourne Meccano Club stand.

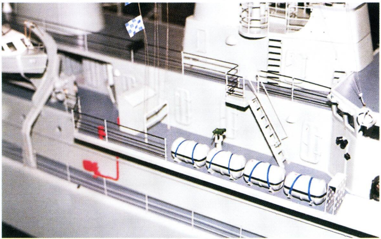
Another item on the Surrey Park Model Boat Club stand was this powerful looking model of the Melbourne tug Otway.

The Wandong Live Steamers mounted an impressive display, but because of the length it was difficult to photograph. There are some beautiful locos here.

This Congreve Rolling Ball Clock was on the MSMEE stand

A fine 1:48 scale model of Destroyer Escort, HMAS Swan

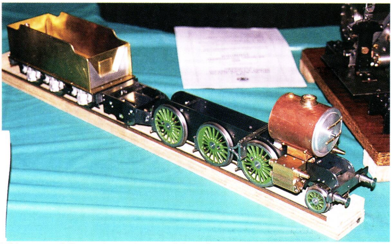
"LBSC Corner" was organised by Stan McKeown and this is a small part of the very large selection of LBSC designed models on display



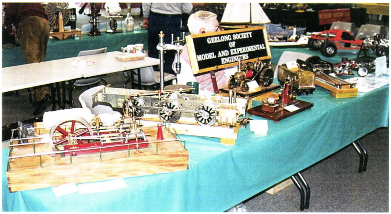
The detail on the model of HMAS Swan *is superb. It was commenced at the end of 1978 and completed just in time for the exhibition*

Some of the timeless body styles of tethered cars.The Victorian Miniature Tethered Racers Association is a young club starting out, and looking to grow. Interested parties can phone Warren Evans on (03) 5976 2126

This magnificent gauge 1 Flying Scotsman *was built up from an Aster kit by Allan Tregea of the Steam Locomotive Society of Victoria.*



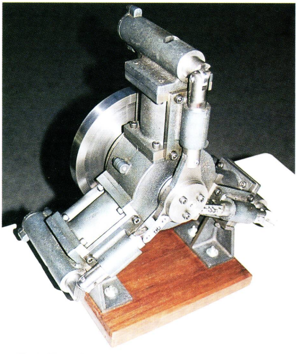
This gauge 1 Green Arrow *is one of three being jointly built by Eric Watts, Jack Harper and Harry Ball of MSMEE. The workmanship is excellent.*



Some of the interesting variety seen on the Geelong SMEE stand

SA few of the interesting variety of models on the stand of the Victorian Miniature Tethered Racers Assoc.

From SLSV, Moorabbin, Chris Murray's superb version of LBSC's $3^{1}/_{2}$" Maisie *won the 2001 President's Trophy*



Ernie Henne's very interesting 3-cylinder radial steam engine features in an article starting on page 11.

Easter in New Zealand — Retrospective

by Dave Giles

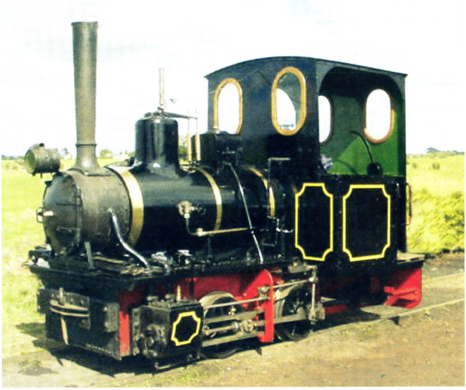
Photos by the author unless credited otherwise

(Dave filed these articles a few months ago but space limitations have made it difficult to publish them until now. The first part of the article (Glenbrook) was covered in detail in issue 103 but it is worth re-visiting if just for these two photos ... Ed).

Glenbrook Vintage Railway — Silver Jubilee Celebrations

The Glenbrook Vintage Railway held special celebrations over the Easter period to mark 25 successful years in operation on its railway track south of Auckland. Locomotives, steam, diesel and petrol were brought from all over New Zealand for the occasion. At various times over the 4 days all the 'imports' were operating on the 6 km of 3'6" gauge track which runs between Fernleigh and Glenbrook.

A large marquee was erected at Glenbrook station where several clubs and other societies had set up their displays based around railway and other steam related topics. The Auckland Society of Model Engineers had a great display of steam locos and other models. Members were present explaining the various items to interested spectators.

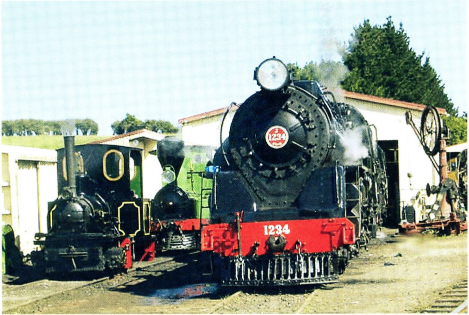


The small Orenstein & Koppel locomotive from Auckland's Museum of Transport and Technology (MOTAT) is 3.5m long and weighs 5500kg in running order.

From Manukau Live Steamers, Roy Sharman's Sinclair-built 7.25"g. Mallet and Eric Burns' Sinclair-built 7.25"g. 2-6-2 Praire loco were on static display. Dave Giles had his 7.25"g. Shay *Enterprise* in steam on a test stand on the Glenbrook station platform for part of the weekend. There were also were several steam boats operating nearby on a local farmer's pond.

The 3'6" gauge railway equipment was covered in detail in issue 103 so there is no need to do so again here. Present were an early Vulcan railcar, a 1926 Model 'T' replica Ford service car which seated the driver and about 12 passengers, a quaint NZR 'A' class 0-4-0T loco, an 0-6-0 Hunslet and an 0-4-0T Ornstein & Koppel steam loco. Also present were a Ba 4-8-0 freight loco double heading with a Ww class tank loco. The GVR owned 'Taupo Totora Timber Co' 2-4-4-2 Mallet was parked up in the workshops for its 10 yearly boiler inspection. This is the only Mallet of its type still operational in the world.

One highlight was a mixed goods train including a few fully loaded passenger cars at the rear hurtling along hauled by a triple headed lash-up of restored NZR J class 4-8-2 locos, J1211, J1234 and Ja1250.



The O&K, a former NZR 'A' class (green) and NZR J1234 stand outside the Pukeoware shed

Keirunga Park Railway — Havelock North

It is hard to believe that 10 years have passed since so many of us attended the opening of the magnificient Keirunga Park Railway in Hawkes Bay over Easter 1992. On Friday morning many of the live steamers who travel with locos were arriving and the scene was set for another great weekend. While the boys were playing trains the ladies were treated to a three hour tour taking in various local sights including the Art Deco buildings and local wineries in Napier and surrounding areas.

After the train operations finished on the Saturday night, local member, Annie Sharman and her Country Music group had a sing along for an hour or so while the evening meal was being prepared. A roast pork meal with all the trimmings was the

Keirunga Park RR signal box with 20 levers to control the yard points

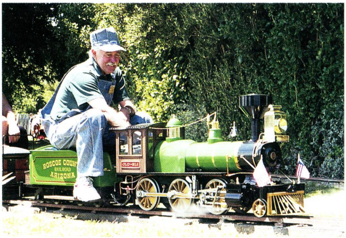
A new loco on the scene — NZR 760, builder not known

Sir Byron, *the Phantom built by Terry Armstrong of Hamilton, styled to look like the early NZR 'J' class 2-6-0.* Photo: Mike Orange

Harold Sinclair on Mallet 2-4-4-2 No.99 Photo: Roger Reynolds

culinary delight to end another great day.

On the Sunday evening a banquet was held at the local Community Centre for the 150 attendees. Life membership certificates were presented to Nola Romanes, John Romanes and John Harman, Havelock club members who had given sterling service over the time the club has been operating. After the formal part of the evening finished entertainment was provided by a hypnotist putting several of the audience under his spell. We instantly had a Salvation Army band, Michael Jackson, Elvis and many other 'stars' at the Havelock Live Steamers 10 year celebration party. This fun session had everyone in constant fits of laughter and it concluded the evening in real style. It was a weekend to remember. Special thanks must go to Nigel Petrie and his organising team who made it all happen with such precision.



Ross Nicholls from Hastings with his Phantom Old Eli, *which won the Ikon Award at the last New Zealand Convention*

At the Manukau Live Steamers track in Auckland, Byron Armstrong drives his father's Phantom with the MLS Dx class loco behind.

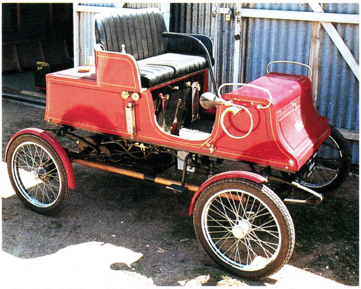
14th Australian Miniature Tra

Traction Action

Tuggeranong Homeste

by D

Photos by the



Kevin Hyde's beautiful model of a 1904 Stanley Steamer from northern NSW is a regular and popular site at these rallies.

What a great weekend! One of the best yet! When are you hosting another one? Just some of the comments frequently heard at the recent 'roadies' rally in the national capital. If they are any indication it must have been an outstanding success.

The venue

The 14th annual rally was hosted by the Canberra Society of Model & Experimental Engineers (CSMEE) at the old Tuggeranong Homestead in Canberra. The Homestead and surrounding land was one of the original farms in the Canberra region, established in the early 1800's, long before the Australian Capital Territory or Canberra were even thought of. It is now heritage protected and surrounded by some of Canberra's southern suburbs. The farm roads, paddocks, old woolshed and other old buildings provided an ideal atmosphere for a gathering of models from the steam era. The very nice on-site licensed restaurant made for a convenient and pleasant venue for the Saturday night dinner.

Friday

I arrived on site fairly early on Friday morning only to find several visitors and their engines already there. The day was already bright and sunny and rather warm for this time of year,

Hailing from southerm Queensland, Warren Starr looks the part as he winds the handle on his barrell organ

Jim Brydon from Port Macquarie dreams of things to come as he drives Bob Campbell's 3" Allchin

n Engine & Road Steam Rally

nberra — October, 2002

ctor

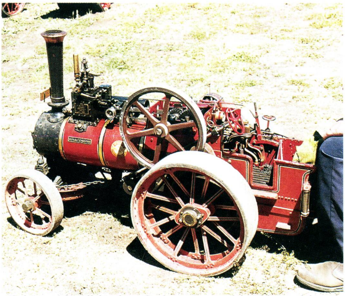
redited otherwise

Traction Action

and indications were that we were in for a fairly hot and dry weekend. Visitors continued to arrive throughout the day, old friends greeting old friends and engines being unloaded. As the sun went down it was time to open the bar and light up the BBQ. Afterwards, the day was nicely rounded off with an atmospheric social evening in one of the old sheds where the models were all stored for the night. There is something about being in an old shed at night, surrounded by lots of engines, where the lighting is adequate without being bright and the smell of warm oil and burnt char (or coal) flavour the air.

Saturday

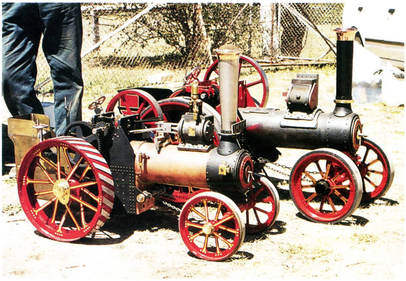
Another bright sunny day with people arriving in greater numbers from very early morning while others must have been getting steam up shortly after sunrise. By mid morning there were a dozen or so engines steaming around the central area of the venue, all being suitably admired by other enthusiasts. Warren Starr was down from Queensland with his barrel organ and entertained us throughout the weekend. Organ music and steam rallies go together rather well. Unfortunately, as the day progressed gusty westerly winds increased in intensity and stirred up the dust on the very dry ground. CSMEE member, Dick Whitfield spent a lot of time doing a great job of damping down the dust to make



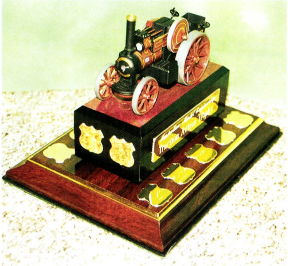
Col Jones' 3" Allchin from Canberra is one of the older models and has been the inspiration for many other Allchins over the years.

One of the few occasions chief organiser John Oliver managed to get to have a drive of his $2^1/_2$" freelance engine. Photo: Rod Visman

John Levers from Mannum (SA) enjoys a drive through the gardens of the homestead on his 3" Buffalo Pitts Photo: Rod Visman



Lawrie Moules' (closest) and Jim Mitchell's Burrells are both 3" scale



The AME 'Traction Action' Trophy

things a bit more comfortable, during which time Bob Campbell belted his 3" Allchin up to fellow Queenslander Joe Timkiv's magnificent Ransomes thresher (*see front cover*). What a great sight to see these machines operating as their full size counterparts would have done those many years ago. The ladies from the CSMEE provided lunches for everyone on both Saturday and Sunday, and as they usually do, they excelled themselves.

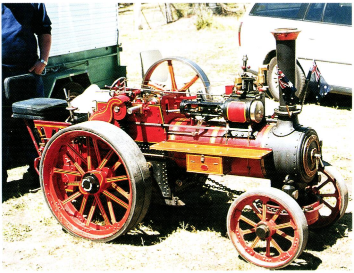
As 2:00pm approached, chief organizer John Oliver started getting everyone organized for a line-up on the curved driveway in the main entrance to the Homestead. Most of the working engines were in the line up, the exceptions being Kevin Hyde's Stanley Steamer which would not fit through one of the gateways, Lindsay Drabsch's Case which was only on static display for the weekend and Chris Athey's Burrell as he was a late

The Bucknell family brought the 3" Burrell built by Anthony's father, Peter. This is another engine which has been around for many years.

John Gibson and his 2" Durham & North Yorkshire engine

Gordon Blake and his $4^{1}/_{2}$" scale Burrell hail from Inverell

Ross Grunwald from Sydney spent most of the weekend on his 3" Cliff & Bunting road locomotive



The largest Allchin was Peter Smith's $4^1/_2$" version The Major.

Models at the rally

Completed

Allchin 3"	Bob Campbell (Qld)
Allchin 3"	Tony Morgan (Vic)
Allchin 3"	Col Jones (ACT)
Allchin 4.5"	Peter Smith (NSW)
Buffalo Pitts 3"	John Levers (SA)
Burrell 2" showman's	Chris Athey (Vic)
Burrell 4.5"	Gordon Blake (NSW)
Burrell 3"	Anthony Bucknell (Vic)
Case T.E.	Lindsay Drabsch (ACT)
Cliff & Bunting 3"	Bob Henderson (NSW)
Cliff & Bunting 3"	Adrian Robinson (NSW)
Durham & North Yorkshire 2"	John Gibson (NSW)
Foden 3" C type truck	Martin Yule (NSW)
Foden 3" C type w/trailer	Peter Smith (NSW) FOR SALE
Foden truck 4"	Dave Watkins (NSW)
Fowler 3" Princess	Mike New (NSW)
Freelance 2.5"	John Oliver (ACT)
Stanley Steamer	Kevin Hyde (NSW)
Tasker 4" Little Giant	Colin Bamford (SA)
Tasker 4" Little Giant	Mark Hampton (SA)
Ransomes Thresher 3"	Joe Timkiv (Qld)

Under construction

Burrell 3"	Jim Mitchell (ACT)
Burrell 3"	Lawrie Moules (NSW)
Foster 6" rope hauling engine	Noel & Scott Smithwick (Vic)
Ransomes Sims & Jeffries 6"	Bob Neal (NSW)

Also on display were several bits and pieces such as a 3" Allchin crankshaft and assorted patterns (Dave Proctor), two 4.5" Allchin copper chimney caps for sale (Peter Smith), a heap of Case patterns (John Bone) and assorted Cliff & Bunting items from Gordon Blake.

Martin Yule on his 3" scale Type C Foden steam wagon

arrival and not yet in steam. Once everyone was lined up, a concerted whistle blowing exercise brought faces to all the windows of the adjoining restaurant. On the same day there was a function on the local scout hall on the opposite side of the property, so in the late afternoon, we were invaded by scouts who were generally fascinated with what they saw, and several were noted to be having a ride or two. Around 80 people sat down to a very fine dinner in the restaurant on Saturday evening, which brought to a close another enjoyable day.

Sunday

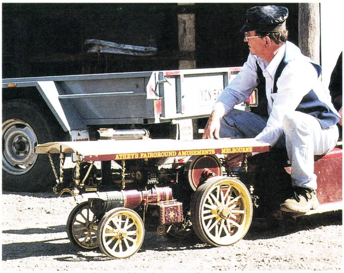
Saturday night must have been a bit harder going as there were not as many early starters for Sunday. As is traditional, about 9 o'clock everyone gathered for an informal meeting to finalise the venue for next year. Paul Stanley from Timbertown convinced us we can expect great things there next October. Colin Warrick advised that Wimmera Live Steamers in Horsham (Vic) would like to be considered to host a future rally.

Once again the winds got up as the

Tony Morgan gives his passengers a ride around the farm behind his 3" Allchin. Photo: Rod Visman

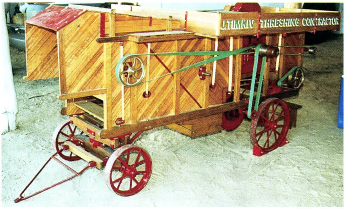
Adrian Robinson, his 3" Cliff & Bunting and the AME Trophy.

Mike New and his 3" Fowler Princess



Chris Athey and his 2" Burrell showman's engine

Bob Henderson with his 3" Cliff & Bunting



Joe Timkiv's 3" scale Ransomes thresher is a work of art!

Dave Watkins' brought his 4" Foden wagon from Mudgee

day progressed and stirred the dust which this time was dampened down by CSMEE president Peter Coleman (found his niche at last!). At midday we observed a minute's silence for the victims of the Bali bombing (it was a National Day of Mourning) and then it was time to present a new trophy for the first time on behalf of *AME*. The **AME Traction Action Trophy** is a perpetual trophy awarded by popular vote of the people present at the rally. The winner gets to keep it for a year and then has to arrange for it to be at the next year's rally. He or she also receives a one year subscription to *AME*. The first name to go on this new trophy is Adrian Robinson from the Illawarra in NSW, as his 3" Cliff & Bunting received the most votes. (Interestingly 5 others tied for a close second so I guess no one paid out large bribes or brought along all the relations!) Well done, Adrian, your peers have spoken!

Before closing, acknowledgement must be made of the assistance of several members of the CSMEE (particularly the ladies) and the co-operation of Pete and Helen, our hosts at Tuggeranong Homestead.

By around mid afternoon many were packing up and pointing their vehicles homeward, some of them no doubt, already thinking about Timbertown next year.

The 4" Tasker Little Giants *of Mark Hampton (left) and Col Bamford*

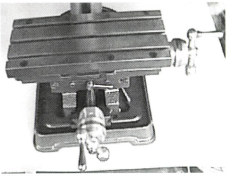
A 'T' Slotted Table Simplified

Make a 'T' slotted table without castings or 'T' slot machining

by Brian Smith

Several rectangular bars are stacked onto a base piece to form 'T' slots then rivetted together. No machining of materials prior to assembly. The level of finishing and therefore level of equipment required to finish the table may vary according to the needs of the builder. The design can be adapted to a variety of applications.

Following is the procedure I used for my first table — 9" x 4" by x $\frac{3}{4}$" with 3 'T' slots. I tried to follow a procedure which would be used by someone with absolutely minimal facilites and material availability.



My finished table

Material preparation

1. The base, four spacers and four top pieces were black MS bar stock purchased either sawn to length or cropped and then hand sawn to length, the ends deburred and checked for reasonable flatness.

2. Two top outer pieces placed over 2 x $\frac{1}{2}$" wide spacers and 2 top inner pieces over 2 x $\frac{3}{4}$" wide spacers stacked onto the base form the T slots. **No machining to this stage.**

Suitable rivets were unavailable locally so I used countersunk head machine screws. I wanted $\frac{3}{16}$" dia rivets but used $\frac{1}{4}$" dia screws allowing for loss of material due to the thread. I think $\frac{3}{16}$" screws would have been OK. I bought cheap screws believing they would be 'softer' or of more ductile material.

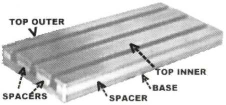
Pre assembly

1. Clamp 1 outer spacer and 1 top outer in place on the base, keeping the 3 outer edges and 1 end flush. Drill 5 x $\frac{1}{4}$" dia holes through and countersink both sides $\frac{3}{8}$" dia, the underside by $\frac{1}{32}$" deep, the top side to $\frac{1}{16}$" deep. Position one hole $\frac{3}{8}$" from each end, the remaining 3 holes being equispaced between them. Temporarily bolt the 3 pieces together with 3 bolts to replace the clamps, 1 each end, 1 in the middle.

2. Clamp 1 inner spacer and 1 top inner to the base so that the top piece overlaps the spacer equally on both sides and using scrap $\frac{1}{4}$" pieces to set the $\frac{1}{4}$" space between the two top pieces. Drill and countersink the 5 holes and clamp the 3 pieces together as for 1 above.

3. Repeat 2 above for the second inner piece to form the second T slot.

4. Repeat 1 locating the top outer against 3 with scrap pieces to form the $\frac{1}{4}$" slot.



Rivetting

1. I cut my $\frac{1}{4}$" screws $\frac{3}{8}$" longer than the table thickness and trimmed the head dia to fit in the underside countersink. All screw heads are on the underside as the screwdriver slot will most likely remain visible after rivetting.

2. Rivet through the eight open holes using scrap pieces to maintain the $\frac{1}{4}$" slots.

3. Rivet through remaining holes progressively removing bolts as each rivet is completed.

4. File the rivet ends flush with the top and bottom surfaces.

The basic 'T' slotted 'table' is complete. Not a precision table but it could be improved from here on to whatever level is required or achievable with available tools and equipment. Machining the 'T' slots has been bypassed. Unnecessary machining of materials has been eliminated. Using bright drawn material would be better if available. These are some options for further finishing the 'T' slot table:

(a) Clean up by hand. Edges and ends file square. Top and underside file clean or flat.

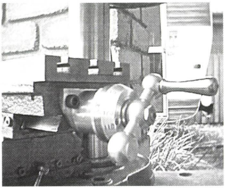
(b) Machine top and bottom faces only. Access to a surface grinder or milling machine required.

(c) Machine both faces plus sides. Access to a surface grinder or milling machine.

(d) Machine ends. Access to a milling machine.

(e) Machine clean up edge of slots. Access to a milling machine.

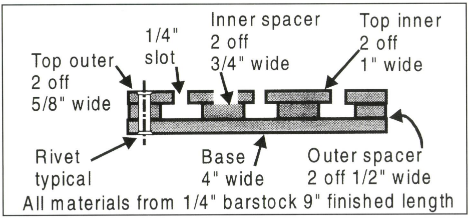
I machined my table top, bottom, sides and ends using a friend's mill/drill.



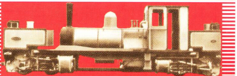
Some additional applications

- Angle plate — use piece of angle iron as the base plate.
- Drilling machine — as a mounting fixture for holding parts.
- Rotary table — either rectangular, square or round configuration.
- Add to lathe faceplate.
- Add to lathe crosslide.

130mm angle plate, 4.5mm strips, using csk screws, not rivets



Garratt Gossip



Garratts in the West

by Richard Stuart, supported by Keith Watson

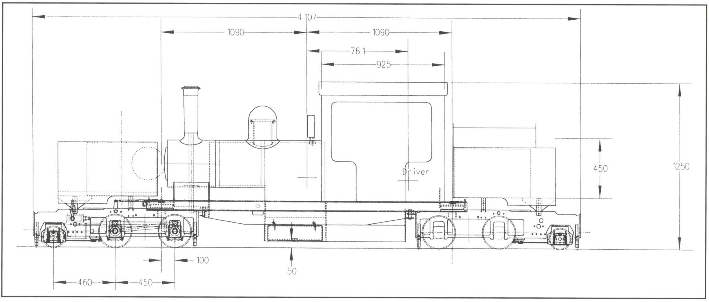
This project was born one afternoon in the winter of 2000. Work was slack, so I sneaked out of the office to watch some of Keith Watson's miniature railway videos. Keith and I were chatting happily, until some footage of the UK Moors Valley Railway came on. At this point, the conversation gave way to a reverent silence. We stared, fascinated, as *William Rufus*, the 7$^1/_4$" gauge Moors Valley Garratt, worked its way across the video screen. Keith had driven this engine some months earlier and fallen under its spell. I too was instantly addicted. An unspoken decision was made there and then. We both had to build one like it.

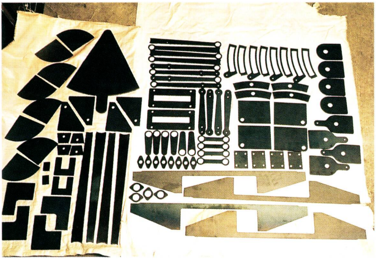
The design work started straight away. Keith brought in nearly half a century of loco building experience. I came in as an active professional engineer, familiar with computer aided design and automated manufacturing methods. The basic design specification soon took shape; 7$^1/_4$ " gauge, 2-4-0 + 0-4-2 wheel arrangement, 3" bore x 4" stroke cylinders, welded steel boiler to the AMBSC code, fully covered driver's cab as per Moors Valley practice, and welded frame construction. Other constraints imposed themselves, such as a wheelbase limit governed by the 13 foot long turntable at our local Castledare Railway. Centre of gravity issues are important with a Garratt, to avoid unequal loading on the power units, and this dictates where you can put the boiler, driver, and water tanks. We soon developed a great respect for the Beyer-Peacock engineers who had worked all this out for the first time nearly a century ago.

A lot of thinking went into the articulation pivot system. We looked at proprietary spherical bearings, automotive components, and metal/elastomer mounting systems, before deciding that the old Beyer-Peacock concept was still the best way to go. For the flexible steam connections, we opted for newer technology in the form of convoluted stainless steel hoses, rather than "traditional" ball joints. In some areas we had individual preferences. Keith is a dedicated Briggs boiler man, whereas I chose a full locomotive boiler for my loco. As the Moors Valley Garratt is non-superheated, we originally decided to follow suit. However, after discussions with Neil Simkins, builder of the 10$^1/_4$" gauge Wells & Walsingham Garratt featured in Issue 94 of *AME*, this decision was reconsidered. An experimental firebox radiant superheater design has been developed as a result.

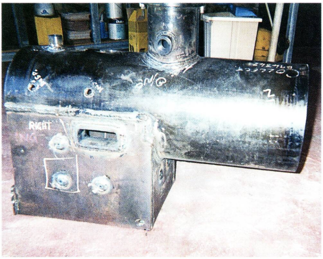
This project is quite ambitious, with a lot of large and heavy components. It was clear that automated production methods were going to be essential to ease the work load. We prepared comprehensive manufacturing drawings for all the power unit and boiler cradle chassis components, and had them automatically flame cut as a batch. At this stage two new members had joined the project, (although they have both subsequently withdrawn due to pressure of other commitments). The resulting four sets of Garratt frame parts formed quite an impressive stack of hardware. The sixteen

William Rufus *of the MVR. Builder, Jim Haylock (in the cab) talks to Keith Watson*

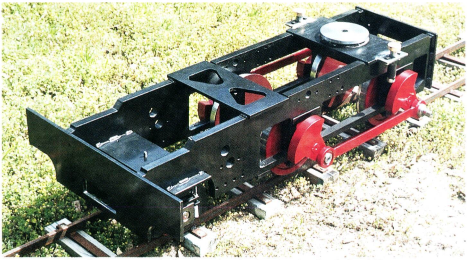




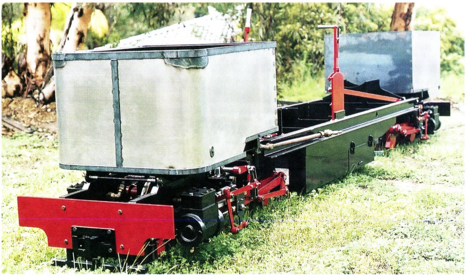
Laser cut parts for two locomotives



The "short, fat" description of the boiler is certainly very apt.



The front power unit showing pivot heel and spring-loaded stabilisers



Rear end view of the completed chassis with bunker/tank platework fitted

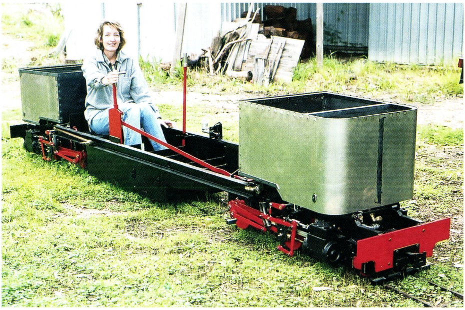
individual power unit sideframes were CNC machined to mill out the axlebox horn guides and bore all the mounting holes. We also made up an assembly jig for the power unit frame assemblies.

All the careful planning paid off as fabrication started. It was a weekend's work to weld up the basic boiler cradle chassis, and another weekend for two power unit frame assemblies. The wheels, axles and fly cranks were CNC machined from CAD drawings. This again took away a lot of repetitive and time consuming work. The CNC components were not cheap, but as I am fortunate enough to have a full time "day job" in the offshore oil industry, I reckoned the saving in precious spare time was worth the money.

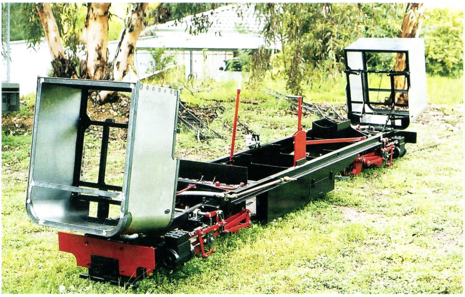
The most laborious job to date has been machining the cylinder and valve chest assemblies. As there are four of everything, this slowed down progress considerably. After this, four sets of valve gear looked a daunting task. However, technology provided a solution. Using CAD, the valve gear parts were simplified to a series of 2-D profiled shapes, with turned bosses fitted at the ends. The 2-D profiles were easy. I emailed the CAD files to a laser cutting firm, and went round a few days later to collect a set of about 100 ready made parts (see photograph). The bosses are simple turned parts, either pressed in or welded to the laser cut profiles. The pivots incorporate needle roller bearings running on shouldered cap screws. The expansion links are also laser cut, and whilst they still needed machining, this was reduced to a light skim on the working faces.

Following Garratt tradition, the boiler is short and fat. It has a generous sized firebox, a $12\frac{3}{4}$" diameter barrel, and a capacity just inside the AMBSC Pt II limit of 50 litres. So far, it has been fabricated, tubed and successfully pressure tested. The boiler plate components were plasma cut from CAD drawings. This cost only a few dollars more than buying the raw boiler plate, and each component comes professionally stamped with identification numbers and backed by full certification. It certainly beats spending hours in laborious marking out, oxy cutting and grinding. The boiler is slightly unusual, in that the firebox walls incorporate access ports for the radiant superheater. The superheater unit will slide in through the ports, allowing easy removal for inspection and maintenance. Steam will be taken off directly from the dome, through an external regulator, and into the superheater inlet header.

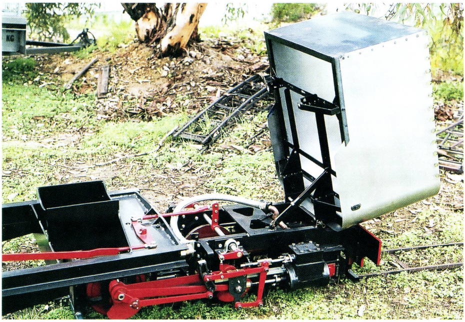
Early on, I had considered incorporating a gas producer combustion system, but deferred this experiment to a future project. Building too many innovations into an already ambitious loco was asking for trouble. However, I did decide that a Lempor exhaust system was worth trying. A preliminary design for this has been worked



Front view. The author's wife, Tricia shows the driver's position



Both end superstructures hinge up to give access to the engine underneath



A closer look at the 'works' of the front engine unit

up, based on a paper by L D Porta and David Wardale's excellent book, *Red Devil*. Another potential idea inspired by *Red Devil* is a feedwater heater. The concept for this is being thought through at the moment.

The loco is starting to take shape with construction of the water tanks. These are arranged to tilt like a car bonnet, to give easy access to the smokebox door and the running gear. The tilting tank idea was used by Beyer-Peacock on some of their Garratts back in the 1920s or 30s. The tank superstructure is lightweight steel, spot welded together. Water will be contained in PVC inner tanks to avoid corrosion problems.

Keith couldn't get started as quickly as he would have liked, due to other commitments. These included a 2-foot gauge American style 0-4-0 saddle tank that needed to be finished. Fortunately, he is now well under way, with the frames welded up and his Briggs boiler completed. He also has a batch of CNC machined components made up. It will be interesting to compare the two finished locos, as Keith has a lot of different ideas of his own to incorporate.

When the chassis was first assembled, it looked big. However, having recently been to the UK and seen some of the larger $7^1/_4$" gauge locos over there, I realised there is nothing exceptional about its size. In view of the recent large vs small loco debate in Australia, I anticipate that there could still be some pointed comments about it. My own views are quite simple. I know fellow live steamers who build in all gauges from $2^1/_2$" to 24", and have the greatest respect for them all. Each person does things differently. Some keep the traditional steam heritage alive with beautiful scale models. Others build utilitarian workhorses. But there is something to learn from all of them. We will keep you informed of progress.

Other Garratt Gossip ...

(From John Cummings)

Recently I emailed Bryan Brinkman of *SA Rail* magazine to ascertain where drawings of South African locos and rolling stock, especially Garratts could be purchased. I received an interesting reply from him advising me to contact the

Transnet Heritage Library
Eurika Deminey (Library Manager)
email: EurikaD@transnet.co.za
or
Tumelo Mdlalo (Client Relations Officer)
email: TumeloM@transnet.co.za

In a take-off of a well known gardening programme host, "That's your lot for this issue"

John's email address is jandpcum@pnc.com.au or you can write to him via the AME office

The LB10 Elbow Gate

by David Mottram

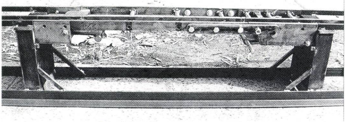
Drawings by the author, photos by David Proctor

(This is the start of a short construction series for a more unusual item — a lifting bridge span, or opening gate which can be adapted for a variety of uses in the steaming bays, on the turntable or even on the mainline (with proper safety signalling, of course). If your railway can use a bascule or drawbridge type opening bridge perhaps this design could fit your need. The article, which comprises minimal text, but many self explanatory drawings, will continue in the next two issues ... Ed.)

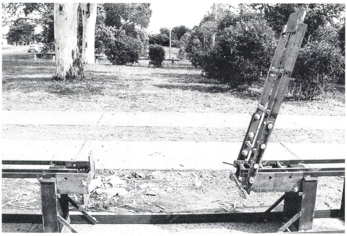
Some years ago, an American steam hobby magazine pictured a 'gull wing 'turntable, although constructional details were omitted. This article represents one interpretation of the same concept in order to obtain the benefits of walk-through access when the elbow gate is raised; provision of a gravity operated stop flap at the open end of the track; and minimisation of nip points that may occur when moving a turntable or traverser to the next position. The raising and lowering of the lift-up gate section appears to be generally free of impact nip points. The tongue of the gate rests between the gauge spaced side plates of the stop section.

An early example of the present elbow gate was on display at the October 1999 Anniversary weekend of the Hornsby Model Engineers at Galston, NSW. Since that time, the elbow gate has been partly constructed with profile-cut plates forming the cheeks of the pivot and the drop end and the two hinges. The costs of this amount of profile work (plus the necessity to dress and re-establish the top-of-rail running surfaces — after profile cutting) resulted in the present decision to return to the use of merchant steel sections for all items except the two hinges, which may also be fabricated when so required. The use of flat mild steel sections (FMS) provides for the elbow gate running rail surfaces to be equal to the rest of the top-of-rail (TOR) running surfaces of the flat mild steel track sections of the builder's layout.

Initially, the steel sections were ordered as 'cut-to-size'. It was soon found to be more convenient and accurate to purchase in longer lengths and cut to each particular size in the home/shed/workshop.



A prototype model of the elbow gate was made up to prove and demonstrate the design, and which will eventually be used by a club in northern NSW. This view shows the gate in the closed position.



The prototype model with the gate in the open position

Description (LB Numbers refer to drawings)

Drawing LB10 shows two side views of the elbow gate. The components are as listed. The elbow gate of this series as drawn is for 184mm ($7^1/_4$") gauge plus inside dual gauge of 127mm (5") gauge. The mid-rails, as shown, are to be positioned to suit a RH or LH build. Two centralised mid-rails could be provided at 128mm apart to suit systems having this requirement. Other systems may also have a requirement for mid-rails at 88mm ($3^1/_2$") gauge.

Builder/operators of systems other than the 184mm gauge currently presented will find it convenient to alter the present drawings to suit their track work requirements.

Operation

In use the LB10-14 span rails are manually raised until the LB10-11 hinges latch onto the round bar of the LB10-13 spring flap. Rail vehicles cannot proceed past the raised LB10-14 span rails, whenever the LBIO-14 span rails are raised. The LB10-16 stop flap becomes upright to protect the open end of the LB10-15 stop end against egress and/or roll-a-way of rail vehicles.

The LB10-14 span rails are returned to the in-line running position by raising the LB10-13 spring flap against the spring pressure to clear the latch and then lowering the LB10-14 span rails into the LB10-15 stop end. The tongue of the LB10-14 span rails rests between the outer rails of the LB10-15 stop end which it enters as soon as the LB10-16 stop flap is manually upset from its gravity controlled vertical position

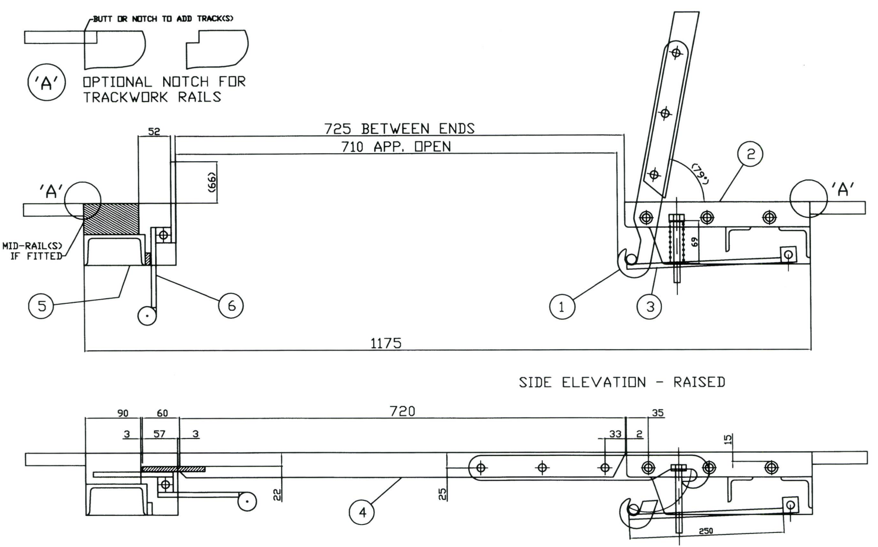
Erection

The outer ends of the LB10-12 pivot and LB10-15 drop end are each shown with three holes on their outer face. These holes are for locational bolting between two vertical faces set at 1175mm apart. The control dimension on the photographed sample was 725mm between the inside of the running rail ends (3mm gap + 720mm rail + 2mm gap). After bolting, a section of 20 x 20 MS bar x 250 long was welded onto the support steel immediately under the FMS outer plates in order to offset the shear pressure on the bolts. The sample assembly used the vertical faces of 320 x 75 RS channel. These members terminated at 35mm below the top-of-rail (TOR) running surface and were capped with 75 x 10 FMS upon which was located the 25 x 12 FMS track rails of the sample.

Alternative erection

An alternative to the above vertical face location of the end assemblies would be to provide 100 x 12 FMS mounting plates below the pivot and LB10-15 stop end assemblies, protruding 25mm past their outer vertical end(s). Each plate would have laterally slotted or holes to provide +/- 10mm longitudinal adjustment when bolted onto a match plate welded to a track support post. The match plate could be provided with longitudinally slotted holes to provide +/- 10mm lateral adjustment of the track's centre line. This presupposes a reasonably accurate location of the track support post and its match plate. Some installations may be improved by the provision of double slotted angles instead of the match plate. These angles would provide for 'rise-and-fall' plus angular adjustment during the assembly.

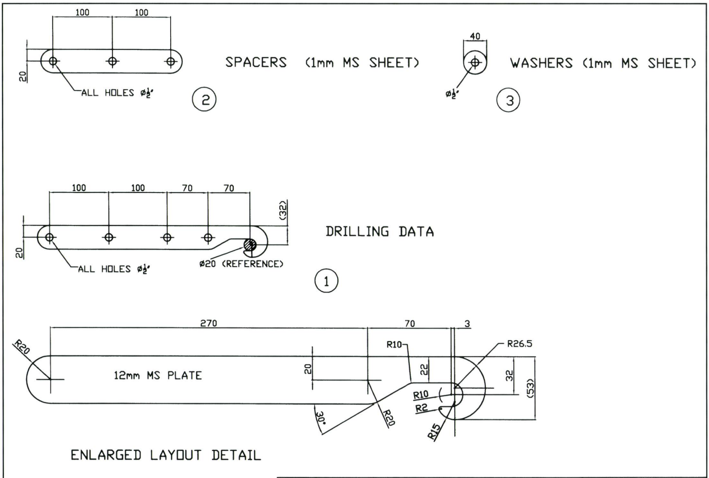
These mounting plates, match plates and/or match angles would be as illustrated on drawings LB10-21 and LB10-22. The LB10-15 drop end can be made with the mounting plate protruding 25mm (Refer Drawing LB10-23). The LB10-12 pivot, as drawn, can be attached to a turntable, traverser or vertical faced member. In locations where the pivot is to be post mounted, the builder may elect to consider using the LB10-20 TYPE 2 - PIVOT, that is 75mm



SIDE ELEVATION - CLOSED

Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference
(7)	(2)	LB10-17 LONG HINGE	OPTIONAL TO #1 -LBIO-1 HINGE
6	1	LBIO-16 STOP FLAP	----------
5	1	LBIO-15 STOP END	----------
4	1	LB10-14 SPAN RAILS	----------
3	1	LBIO-13 SPRING FLAP	----------
2	1	LBIO-12 PIVOT	----------
1	2	LBIO-11 HINGE	PROFILE OPTION
Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference

Itemref	Quantity	Title/Name, designation, material, dimension etc		Article No./Reference	
Designed by DGM	Checked by ------	Approved by - date -------	File name LB Gate	Date 8.4.2002	Scale 1:
			LB GATE - SIDE VIEW - 184G		
			LBIO	Edition A	Sheet 1/1



Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference
3	2	WASHER (lmm MS SHEET)	FIT BETWEEN HINGE & PIVOT
2	2	SPACER (1mm MS SHEET)	FIT BETEEN HINGE & SPAN RAIL
1	2	12mm MS PLATE	PROFILE CUT or FABRICATE
Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference

Designed by DGM	Checked by ------	Approved by - date -------	File name LB Gate	Date 8.4.2002	Scale
			HINGE		
			LBIO-11	Edition A	Sheet 1/1

longer to simplify the underside access to the LB10-13 spring flap.

Costs

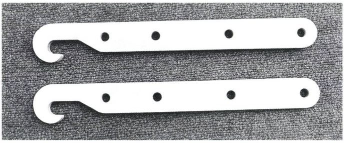
The material cost of the LB10 LB GATE would seem to be just under $300 each plus the costs of the mounting plate set(s).

Construction

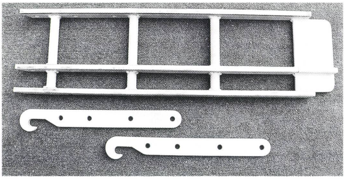
All items were carefully belt linished to remove mill scale before marking out. This enables the builder to select the most suitable FMS edges to be used as the running rails.

Hinges (LB1O-11)

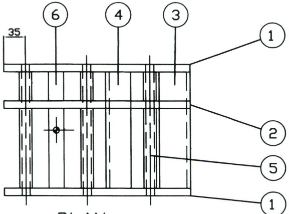
These are the only profile cut components. The profiled edges are linished smooth and the outside surfaces freed of mill scale. The profile of the latch hook is important to its proper operation. Adjust the position of the LB10-13 spring flap to obtain smooth latch catch operation. A 20mm OD x 12mm button was used to identify the centre of the latch hook. The centre of this button was used as a reference from which to establish the 70mm spacing to the first drilled hole, being the pivot hole. The other three holes were set out using the pivot hole as the datum. The 1mm hinge spacer is set between the LB10-11 hinge and the LB10-14 span rails. A 40mm 0D x $^1/_2$" ID x 1mm washer is required at the pivot point between the LB10-11 hinge and the LB10-12 pivot. (This applies to each side.) The bolts used are $^1/_2$"BSW x 52mm hex head including hex nuts and 27mm OD washers.



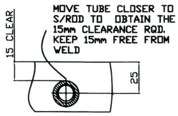
Hinges (above) and with span rails (below)



MULTI-GAUGE TO BE RH OR LH TO SUIT MID-RAIL POSITIONS

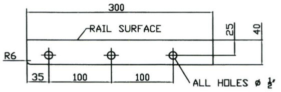


PLAN

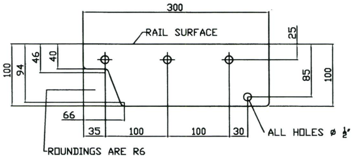


15 CLEAR
MOVE TUBE CLOSER TO S/ROD TO OBTAIN THE 15mm CLEARANCE RQD. KEEP 15mm FREE FROM WELD
25

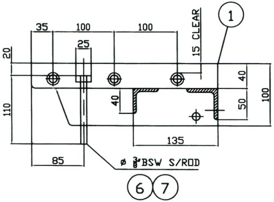
ENLARGED ⑤ TUBE DETAIL



② DETAIL FOR MID-RAIL(S)

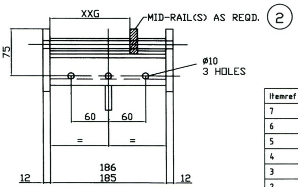


① DETAIL FOR SIDE PLATE



FRONT OF PLAN

(SECTIONAL VIEW)



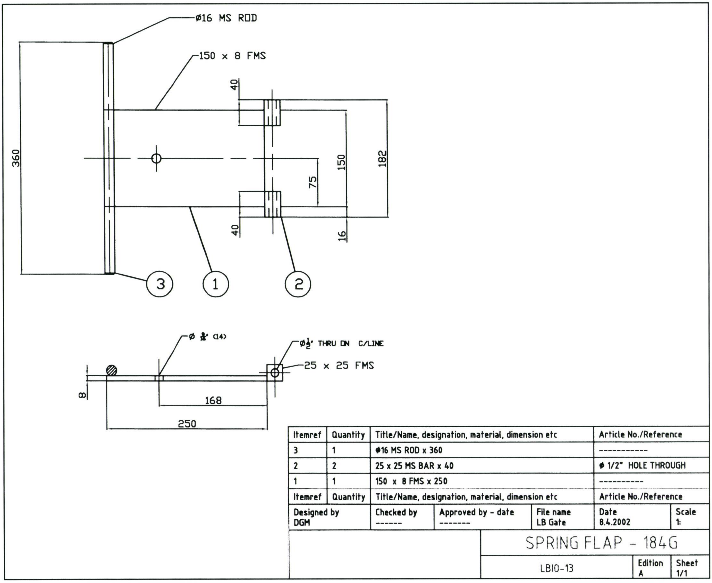
RH VIEW

Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference
7	1	3/8" BSW S/ROD x 110 plus NUTS & WASHERS	INC. VALVE SPRING
6	1	25 x 12 FMS x (185)	(CUT TO SUIT MID-RAILS USED)
5	3	NB15 TUBE X (185) (MACHINE ENDS)	(CUT TO SUIT MID-RAILS USED)
4	1	40 x 40 x 6 RSA X 185	----------
3	1	50 x 50 x 6 RSA x 185	----------
2	To suit	40 x 12 FMS x 300	(MID- RAILS WHERE USED)
1	2	100 x 12 FMS x 300	----------
Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference

Designed by	Checked by	Approved by - date	File name	Date	Scale
DGM	------	-------	LB Gate	8.4.2002	1:

PIVOT - 184G

	Edition	Sheet
LBIO-12	A	1/1



Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference
3	1	ø16 MS ROD x 360	-----------
2	2	25 x 25 MS BAR x 40	ø 1/2" HOLE THROUGH
1	1	150 x 8 FMS x 250	----------
Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference

Designed by	Checked by	Approved by - date	File name	Date	Scale
DGM	------	-------	LB Gate	8.4.2002	1:

SPRING FLAP - 184G

	Edition	Sheet
LB10-13	A	1/1

The alternative LB10-17 long hinge has an extra hole beyond the latch hook. This hole should align with the second hole through the LB10-12 pivot and can be used for pin locating the LB10-14 span rails in the in-line position.

Pivot, span rails and stop end

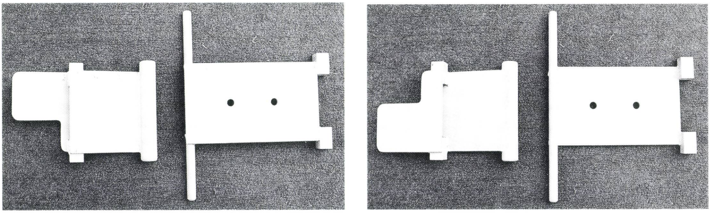
LB10-12 PIVOT; LB10-14 SPAN RAILS; and LB10-15 STOP END.

The flat MS components of these items are marked and drilled $^{1}/_{2}$" as shown.

All NB15 pipe spacers are cut at right angles and are cleaned of burrs both internally and externally. Clamping for welding is by means of $^{1}/_{2}$" BSW screwed rods. Assembly may be simplified by building up upside down with the top-of-rail running surfaces set against a flat surface in order that the rails heads and ends are appropriately positioned. Setting up of the LB10-14, Item 3, tongue plate is important. The LB10-14 Item 7 mid-rail may require some reduction on its underside to obtain the required top-of-rail alignment. Similarly, the LB10-15 Item 4 mid-rail may require some underside reduction for the same reason due to variation in its height due to the position of the LB10-15 Item 2 angles.

More drawings next issue ...

Below and below right: top and bottom views of the spring flap and the stop flap, the latter to be described in the next issue



Tracks 'n' Trees

Put a Railway in Your Garden — part 2

by David "Doc" Wescombe-Down

(This is a continuation of the story appeared in this column in issue 104 ... Ed.)

Given time, the space and the superb autumn weather in Adelaide this year, Ingrid and I decided to extend the garden O gauge railway by adding another end loop containing about 13 metres of track.

We are a couple who get something done, then take time to reflect on what we have done, and what we might yet do. Sometimes we can visualise it all right up front, but there are other times when we have to build or paint something in order to get our 'benchmark'. During these times, we might frequently take one another outside to look at a particular section and try to both picture the idea at hand. We reject quite a few such ideas, but once we agree on something, it's all hands on deck (as we used to say in the Navy) and we get busy with our respective roles to make the change or addition.

This particular track extension involved excavating a "pond trench" about 3.5 metres long, with a width varying from 300mm to 900mm and depth from 250mm to 480mm. It was dug in such a way that it creates an illusion of being connected to the existing 2.4 by 1.5 metre fishpond by a subterranean tunnel or hidden ravine. Once the trench was dug and all potential rough "nasties" removed, trampled flat or covered up, it was lined with two layers of thick black plastic sheet.

The now-exposed concrete foundations for four of the "postlettes" supporting the original trackbed received extra padding by way of folded poly stock fodder bags. All this to minimise future holing by water pressure on irregular edges.

The garden hose was turned on, and, as the new pond liner filled, it was massaged into place. Once filled, the liner can't be moved, of course. We divided and potted some Vallisneria (ribbon plant) from our larger pond and outside aquariums, then added those new pots plus floating duckweed to their new home. Snails and fish from the larger pond went in a week later once the new pond water had stabilised chemically and any solids had settled. Now for the trackbed extension.

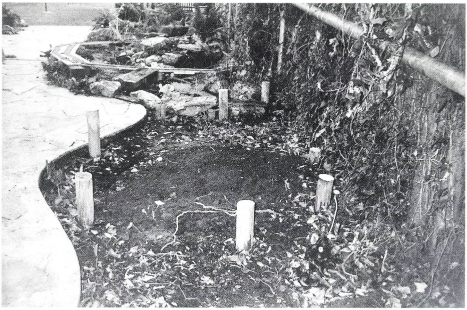
We first tried to use some large Boral 2-bay concrete blocks as road bed supports for the extension instead of more treated pine posts — just trying to recycle what we had, and we had 11 of them, which was exactly enough. Spacing was to be about 900mm and they were to be lying on their long sides with the bays open to the front and rear.

However, after much dirt scratching and shimming (old bricks, broken terracotta tiles and pieces of slate) in beds of mortar for each block, we decided they did not blend in with the rest of our layout. So, they were pulled out and have been laid aside for another project on another day.

Re-enter the treated pine post et al (*see Part 1, issue 104*) and 10 of these were cut to create another flyover loop.

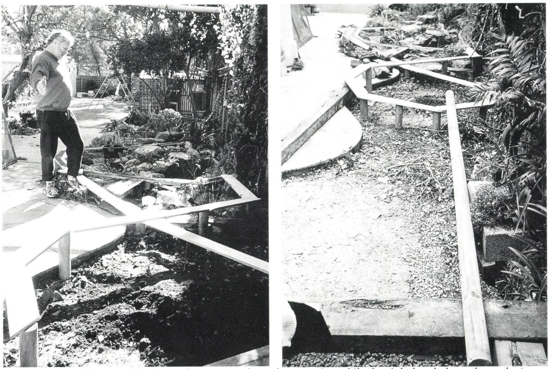
The same procedure was used as in the original trackbed construction, and we now have about 40 metres of track in a long narrow area of approximately 13 by 3 metres - the smallest of the three loops has a diameter of six feet, the largest, nine feet, so it is a layout best suited for short locos, short rolling stock and the running of short trains.

The 140 x 19mm PAR treated pine trackbed with marine carpet sound absorbing strip is quite easy to instal. We may edge both



Work begins on the extension. Support posts are in place

The extension begins over the second pond sides of the trackbed with 25 x 3mm exterior timber and then "loose ballast" using a drymix of cement powder and dolomite all the way round. Once wet, the dolomite will aggregate somewhat, and that will suffice for our needs. First priority though, is to get the new track installed and working properly.


"This wide would be good!" The author contemplates the extension while the right hand photo shows the 'area designate' for the second overpass and third loop extension

Remember the brass rail in storage? We also decided to give it an airing, and have lifted up all the Peco Streamline O track to replace it with the brass track, handlaid fixed with 13mm brass escutcheon pins in 3.6 metre lengths on 70 x 10 x 8mm meranti sleepers cut with a Ryobi bandsaw. Our brass track has been assembled, handlaid and pinned in situ. Brass rails are easy to curve and a railbender was not required, but if you do need one, here is a rough sketch (**Figure 1**) of one we made once from two old Ezybilt or Meccano $7^{1}/_{2}$" perforated strips (the ones with 15 holes, not 11), three 8mm bolts, three thick spacer washers, some flat washers and hex nuts.

Time to get serious and active outside again! We got to work and built a small rockery adjacent to the new pond. An unwanted car tyre was placed on ground zero and then filled with rubble looking for a home. After a barrowload of earth had been tipped over this, we ringed the resultant mound with moss rocks. The earth was compacted gently and the rockery increased in height by random layering of more rocks and earth, making sure that the rocks and pond liner edges were arranged to prevent dirt from gradually sliding into the water.

For anyone planning to construct large rockeries, hills and "natural" dividers in their garden layouts, irrespective of scale and gauge, I can recommend the use of unwanted tyres. Build them up in layers, filling each tyre with dirt and rubble. When I had the farm, I once built a raised feature in the house paddock this way, and it measured about 20 metres by 6 metres with a metre of height at its highest point. It's a user-friendly way of disposing of any unwanted tyres.

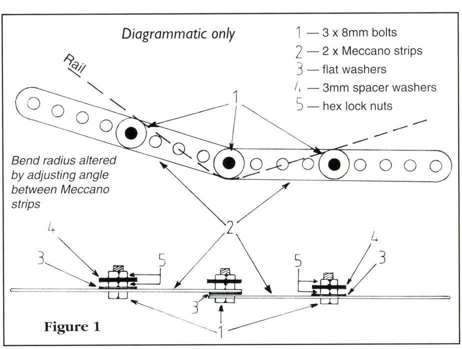


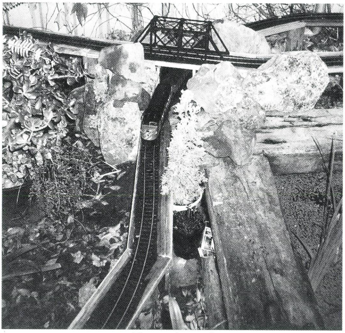
Figure 1

Ingrid got to work and planted Alyssum, Erigeron (Profusion), Lobelias (Cambridge Blue), Pansies (Edgewater Mix), asparagus ferns, curly leaf parsley, Curry Plant, relocate self-sown Irises and a ground-hugging Shore Juniper. Nearly everywhere else received Baby Tears! Once all these are established, both in the ground and in pots, we can train them to cover the still-visible areas of black plastic — we recycled some treated pine fence palings by nailing them to the trackbed, thus forming a "skirt" all around the layout. Once the ferns and other plants cascade down over the paling pieces, the effect will be quite subdued and very palatable to us.

With the advent of brass rails, we have also opted for radio control of a couple of our locomotives. Tony Walsham of Remote Control Systems (Bayswater, Victoria (03) 9762 7785) provided very prompt, helpful service, supplying us with a basic RCS unit including an A-B toggle switch enabling dual train control from the one handpiece. Each locomotive has its own data receiver-throttle modules installed. I made up a nickel metal hydride pack of 12 (4 x 3) 1.2 volt 1500mA cells for the mobile items, and the hand controller uses a standard PP 9 volt battery. The other locos run on battery power without remote control, and we eagerly await the first of our "shorty" live steamers, which will be fitted with R/C.

We have built a number of lift in/out diaromas to enhance our outdoor operation, and they also fit onto a 10m by 450mm O tracked shelf line in the workshop — a bit like "active-passive storage" for them, out of the weather when not in use!

A junk and scrap-metal yard, farmyard and wood-coal merchant yard have been completed. These have been excellent indoor projects for winter nights and are built on 600 x 300mm MDF and ply bases. A large mill with a 350mm waterwheel is under construction at present. We also made nice portals for the overpasses from scrap pieces of mossrock



Moss rock portal

and now have a live steam stationary engine ready to power a major trackside industry. Just need to lag the boiler and encase it in timber strips to "date" it.

Removable Bachmann "Plasticville"® girder bridges and other kits have been incorporated into the layout, both solo and in dioramas. We paint these with acrylics to provide a bit more outdoor protection, but put most of them away when not in use. Ingrid has also been busy making 38mm figurines to dress up our illusion further — not much choice in O gauge people is on hand in Australia, and we bypass the fancy European prices of those that are.

Even with our new extension, our garden railway is not large by some standards, with about 1.8 scale kilometres having lap times of two and a half minutes so the illusion must continue. There are a few ways that any of us can make our layouts appear larger than they are. These might include:

- run trains slowly and have them stop often
- have short trains of short rolling stock
- ensure that there are minor variations in track elevation, even if it is supposed to be a 'flat' track
- don't crowd the available space with track
- use sweeping curves instead of straights
- periodically hide the track behind rocks, pots and short tunnels (remember — you have to be able to clean in there!)
- break up the track layout with bridges, roads, cuttings and water
- use sound and animation whenever possible — stationary live steam, electric or air-powered activities for example. We have a number of excellent CDs providing steam and diesel activity:
  The Age of Steam by Transacord UK CD ATR 7037 stereo 1987
  Trains in the Night by Transacord UK CD ATR 7049 stereo 1996
  Trains, Planes and Automobiles by Distributions Madacy Inc., Canada, SE-2-5508 undated
- use buildings, miniature conifers, people, animals and potplants to break up views
- miniature scenes attract attention, promote imagination and interest
- vary ground covers but also use lots and lots of Baby Tears
- restrict the amount of track visible from any one observation point.

Layout maintenance means hand picking leaves and twigs, installing any scenic modules required and we are then ready to select the loco and its consist — let's go!!

We love our shared interests and hope you have similar good fortune when you "Put a garden in your railroad!" Cheers!

More Resources ...

Some local suppliers ...

***Rails in the Garden* magazine**
Published 4 times per year for $15.00 currently
Michael Bickford, 41 Nalya Road, Berowra Heights NSW 2082
email: womloc4@ihug.com.au

Argyle Locomotive Works (regular *AME* advertiser)
ph/fax (03) 5968 6573
email: argyleloco@fhills.hotkey.net.au

Ferntree Garden Railways and Miniatures
Phone: (07) 3206 3665 Fax: (07) 3206 2175
email: ftrm@powerup.com.au

PAMAK Hobbies
Phone: (02) 4684 2727 Fax: (02) 4684 2728

G Scale Hobbies
Phone (mobile): 0418 624426
email: gscale@qpa.com.au

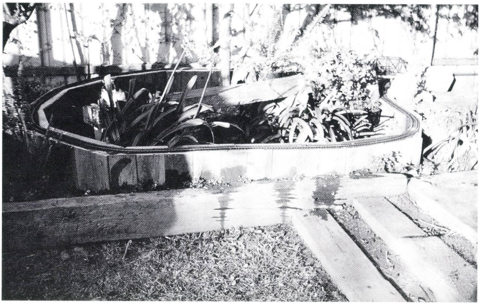
Rishon Locomotives
Phone: (02) 6629 1115
email: rishon@dingoblue.net.au

... and some from overseas

Cherry Scale Models
The Stables
25 Church Street
Langham
Oakham
Rutland LE15 7JE. UK
Fine scale Gauge 1 live steam and electric locos. Send SAE for details

Gauge 1 Lines
Sittsville Ontario
Canada

More next time



Treated pine paling "skirt" installed on largest (9') loop

Club Roundup

Compiled by David Proctor

Auckland, NZ

The Club is considering introducing a new approach for our traditional Easter weekend's activities. Downstairs will be reserved for locos, traction engines, and the heavier models. Upstairs will house, on separate tables, scale models, stationary engines (running on air) and small traction engines, tools and tooling, aero engines, horological items, books and drawings, and for the first time, a sales table devoted to quality fittings and parts as well as completed models. Railway tea and coffee will be on sale all day from the kitchen. Track running will be as normal with the addition of a children's quiz competition with prizes.

Auckland Society of Model Engineers
Location: *Petersen Road Reserve, Waipuna Road, Panmure*
Public Running: *Every Sunday*
www.asme.org.nz

Balcatta, WA

After Saturday preparations for the October Sunday run we were faced with another dismal day weather-wise, which is of course disappointing. Even more disappointing was the discovery that another 30m of fencing was demolished by vandals.

We are now officially able to use our new Club House so all meetings will be there. Stage 2 of the project is now under way, which involves a fire resistant ceiling in the kitchen, plumbing and a ceiling upstairs. We were fortunate in having a complete kitchen donated.

Northern Districts Model Engineering Soc.
Location: *Vasto Place, Balcatta*
Public Running: *Last Sunday*
http://www4.tpg.com.au/users/jimclark

Bulla, Vic

All the station beams are now in place and it is time to tackle the purlins, fascia, guttering, wire, etc. The next major job is the station roof and weather permitting, it is anticipated that this will be erected and screwed down early in October. After this the septic and inside plumbing can be undertaken. Things now seem to be progressing at a great speed.

Also now looking at the station entrance way area — there are some earthworks to be done, and safety fencing and entrance gates to be erected before the public can begin using the new station area. A set back earlier in the year was that some 31 sections of fencing, earmarked for part of this job, 'disappeared'.

Some members are busy building new bogie assemblies for the $7\frac{1}{4}$" carriages; the first already being successfully completed. On the small track scene another point set has been completed leaving six to do.

The WWW (Wednesday Willing Workers) are discussing making one Wednesday a month a play day in the afternoon which will make a break for some fun. It will be a time to get some more of the small gauge locos out and get them up to scratch for the coming return to paying service.

Tullamarine Live Steam Society
Location: *15 Green Street, Bulla*
Public Running: *1st and 3rd Sundays*
www.netconnect.com.au/~tlss

Burnaby, BC Canada

We're getting towards the end of the year and we seem to be in reasonable shape. The passenger count is about 1% ahead of last year, our best year. Some track maintenance is being done, and while we will need more, the trend is encouraging. Plans for a canopy over the passenger waiting area are winding their way through the City bureaucracy and we hope to have the building permit soon.

The Alberta Model Engineering Society members have laid the first 350 feet of $7\frac{1}{2}$" gauge track at their Airdrie site. They have pre-built sections using scale steel from Switzerland, and prepared their roadbed well. They got that much laid in a day including a switch. By now they may be well on towards their first circuit of 220 ft. Their 11 acre site east of the town has had some condos built nearby, and the club hs managed to get the developers to do much of the grading of the hills and lakes. Their CPS style maroon station/clubhouse is also an eye catcher.

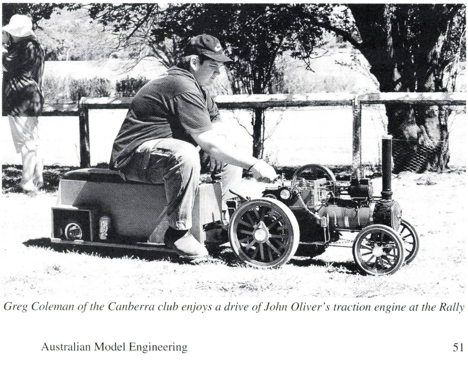
Construction has now begun on the raised track. Thanks to Cliff Cotton and his bobcat, the first 34 holes are augered in, enough for the first 216 feet (66m), or a bit over a quarter of the final track. The first concrete columns have been poured and the raised track Committee hopes to have all phase 1A columns done before the weather turns (really) bad.

The club's new battery electric 24v DC loco has been towed around the track successfully. At least the chassis has with the motors mounted but no electricals installed. Bruce Wilson now has it and is working the electronics. there is at lest 40 hours of work there, as brackets etc have to be made as well as wiring and bolting everything in. Dave Simpson is painting the body in the three colours for early CNR F7's and the paint has to harden well before put into service. So its all coming together, and we hope to use the F7 at Lougheed Mall for the Christmas run, with the Boxcab CN loco as standby.

***British Co**lumbia Soc. of Model Engineers*
Location: Rainbow Creek Station, 120 Nth Willingdon Ave, Burnaby, BC.
Public Running: *Saturday, Sunday & public holidays, Easter to Thanksgiving*

Canberra, ACT

At our recent invitation run while attendance by visitors was down from recent years,



Greg Coleman of the Canberra club enjoys a drive of John Oliver's traction engine at the Rally the smooth and incident-free weekend presented a firm foundation on which to build. The impeccable presentation of the site was a credit to those who worked hard to make it so. We received many enthusiastic comments from visitors on the decision to break with tradition and hold the run on a non-public-run weekend, giving more play-time. An assessment of traffic volume indicates we could comfortably cope with double the number of visiting engineers, a goal we intend to aim for next year.

The September Running Day on the following weekend was a spectacular success, in that it is the first time takings have topped the $2000 mark; thanks to Anne Clifford who works enthusiastically.

The club hosted the Traction Engine Rally which was also a great success (*see page 34 for full report*)

Canberra Society of Model and Experimental Engineers
Location: *Geijera Place, Kingston*
Public Running: *Last Sunday*

Casino, NSW

The NSW Labour day weekend in October proved to be another great anniversary open weekend (12th) for our society. Members turned out in force both local and further afield from Ipswich and Brisbane. With four steam and four diesel locomotives hauling passenger trains the public were well catered for. We also welcomed visitors from clubs as far south as Newcastle and Gosford, who made the 600k trip on the Thursday. They set up tents in the old station compound and enjoyed full use of our track on the Friday and Saturday, then jumped in with vigor and helped out on the Sunday/Monday public running.

At the October general meeting a lot of business dealt with the forthcoming 2003 Centenary of the Old Casino Station building. Much planning is under way for next years celebrations and following various representations to State Rail Heritage, our local Council and other interested parties, the replacement of the old station platform will go ahead for the 2003 centenary.

From the Permanent Way engineer's report it was agreed that now the old tree at the northern entrance to the triangle on the Queensland loop has died, the much longed for realigning of the 'tight curve' be attended to ASAP. Under the terms of our council lease, we had to go round the tree, as it had to stay. A very tight curve resulted which caused many problems over the past twelve years. From the Loco Shed came the report that EL51 is to be named "JACK" in memory of our late member and friend " Jack Jenkins.

Pacific Coast Railway Society Inc.
Location: *Queensland Rd & West St, Casino*
Public Running: *Every Sunday*
http://www.casinominirail.com/

Clare, SA

With the wet and cold starting to ease up and some days of sunshine warming the bodies a bit, it has enthused the members to get on with some projects. A much needed safety fence and sealed platform area at the station became the priority. We solicited the advice of a local fencing contractor who, after surveying the project, and contemplating its cause, generously donated the post and rails, which left us only to purchase the pickets and screws. Likewise after some discussion with a local landscape firm we also came up with a good deal for 54 square metres of pavers.

Week one saw us with bobcat, sand and scrapers, levelling the site, then boring holes and cementing in posts. Week two came up on Father's Day, but with the temptation of a BBQ tea and extras, we had a good roll up and with the guidance of Terry Stewart, the paving got done and really looks good. Week three saw the rails on the post and a lot of tidying up done around the place, pickets cut and painted ready to install. Week four, on with the pickets and appropriate signage to keep people in control. It all looks great and has proven to work well. It's hard already to remember the old iron droppers and rope with stones under foot. The last minute idea by Ivan Victor for some 'C' channel benches along the station wall for creature comfort has really set the scene.

Clare Valley Model Engineers Inc
Location: *Inchiquin Lake Park, Clare*
Public Running: 1:30pm *2nd & 4th Sunday*

Cobden, Vic

The most active season for the Cobden Miniature Railway is almost with us again. From the Spring Festival on the 3rd weekend in October, right through till after New Year, there is hardly time to recover one's breath between public and private runs.

Spring Festival weekend on 19 and 20 October saw many familiar visitors with their locomotives join us at the track, and after a play day on Saturday everyone enjoyed a spit roast dinner and lots of tales were told. On Sunday, everybody got down to providing over 800 passengers with a day's entertainment riding the rails. Despite an early gloomy weather outlook the day just got better and better, and every one who took part went home feeling a great deal of satisfaction.

The next major effort is New Year's Eve when the Miniature Railway Park takes on a total family flavour with carnival, concerts, mini golf, food and fireworks. This is always a great night with up to 5000 people attending, and the trains run until there are no passengers wanting to ride! We are always grateful to our visiting engineers on this evening because they provide terrific support and assistance and give our public the opportunity to se a wider range of locomotives and rolling stock.

The new committee which was elected at our AGM in August has been working hard and effectively in ensuring teamwork and good cohesion between members and the effort is paying off. New and refurbished locos will be coming to the track over the next few weeks, and we are looking forward to further additions to the resident fleet in the months to come.

The club has a new mailing address at PO Box 14, Cobden, Vic 3266

South Western Model Engineers Inc
Location: *Miniature Railway Park, Cobden*
Public Running: *3rd Sunday*
www.gatewaybbs.com.au/mintrain

Gosford, NSW

The recent annual general meeting saw the retirement of our long serving Secretary Edith Bearman. The new Secretary is Peter Holt.

Just for fun here are **some interesting statistics** — Allan's XPT and John's 421 Class have run together on a total of eight running days since February 2002. In that time the records show that they have carried 1221 passengers (512 adults and 709 children) on 101 trips. Each trip takes around 8 - 9 minutes depending on traffic.

Using a conservative estimate of weight per passenger this comes to a new weight of over 60 tonnes over the above period of time. These weights are calculated as follows:

Weight of 2 locos + 2 driving cars + 4 carriages = 560kg

Weight of 2 drivers + 8 adults + 12 children = 1140 kg

Total rolling gross = 1700kg

Central Coast Steam Model Co-op Ltd
Location: *Lot 10 Showground Rd, Narara*
Public Running: *1st Saturday*

Hamilton, NZ

The $3^{1}/_{2}/5/7^{1}/_{4}$" track is now complete and is in use. What a wonderful trip for the $7^{1}/_{4}$" across the wooden truss bridge. We now once again have a track for the small $3^{1}/_{2}/5$" locomotives. A new track has been added through the station and across the smaller bridge before entering the main line for a short time and then back to the station. This will ease any congestion on the main lines and will allow the smaller engines to travel at their ease. There are now five lines entering the station and with all the lines in use, we will be able to cope with the larger crowds.

The bank retention along by the new bridge has been started and this is looking good. By 2004 the plants will have grown and hopefully hanging over the edges. The trees are growing at a phenomenal rate and are all once again in leaf. Mulch has been put around the trees and bushes and this will keep down the weeds and beautifies the area.

The locomotive and trolleys from the Lake Railway have been put out on display (on tracks) for the public to play on.

Hamilton Model Engineers Inc
Location: *Minogue Park, Tui Avenue, Forest Lake*
Public Running: *Every Sunday*
http://communities.msn.com/HamiltonModelEngineers

Invercargill, NZ

Our 2002 Great Little Train Show was described on our bright yellow posters as our "biggest ever" and so it proved to be. An extra hall was used, more layouts were displayed and more people attended.

We had very positive feedback from our out of town visitors who all felt that the Labour Weekend date was great and serious consideration must be given to staging the Great Little Train Show at Labour Weekend 2003. On both days there were long lines of passengers waiting for train rides and at one stage it was reported that seven locomotives were busy on the track, at the same time Our engineering group were ably supported by members from the Otago and Gore clubs with their locomotives. Thank you very much for all your help.

For a modest sum, radio controlled boats were available for the public to show their skills, navigating around the pond while some were lucky to be able to ride behind a model traction engine. The Fire Service appliance also attracted an interested crowd.

Sixty sat down to a delicious evening meal on Saturday and were then entertained by a talk on the Otago Excursion Train Trust from Allan Fraser. Warren Jones was presented with a framed certificate, from the committee, acknowledging his role over the years, in organising the show. Early indications are that, financially, the show is most likely to be our best ever

Southland Soc of Model Engineers Inc
Location: *Surrey Park, Invercargill*
Public Running: *None*

Maidstone, NZ

Brian Shears and Alan are making very good progress in construction of the new Club Locomotive, the re-gauged battery electric engine, rebuilt and re-bodied to suit 7$^1/_4$" g. ground level operation. Only a small amount of additional body work is required and some control equipment to get the job going. Further plans include the development of automatically controlled battery charging gear but that may have to wait a little while.

We have had a couple of fine weekends and have managed to run on both scheduled running sessions this month. I think it is the first time we have managed that for some time.

Maidstone Model Engineering Soc. Inc
Location: *Maidstone Park, Upper Hutt*
Public Running: *Every Sunday afternoon October-April*

Melbourne, Vic

The Annual General Meeting has been and gone with a few new faces coming onto the committee, which is a good thing to see.

At the last month's meeting we where lucky to have Harvey from Adelaide who presented a talk on bell founding, an art which not too many of us would be familiar with. You just don't realize what's involved in tuning a bell correctly.

Also in this period we have seen our model engineering exhibition take place at Monash University. We all feel the event went well and everyone we spoke to enjoyed his or her time there. I'd like to take this opportunity to thank all those clubs and people who exhibited and help out for without their efforts we surely couldn't run such an event. There was such a variety that I couldn't mention it here. (*A report begins on page 28 ... Ed.*) We hope to see you all back again in two years time or at Bendigo's exhibition next year. I found it is such good fun talking with people who have similar interests and all in the one location to boot.

We hope you had a merry Christmas and a happy new year.

Melbourne Society of Model and Expeimental Engineers
Location: *Meetings are held 2nd Friday of month at 92 Wills St., Glen Iris, 8pm start.*
Public Running: *None*

Millswood, SA

The Safety Valve Run, held on Saturday June 23rd again attracted some 70 people amid a day temperature of 16 degrees and a light shower of rain. This later gave way to fine weather and a cold, still night, perfect conditions for a night run. Eleven locos turned up and put on a good show for the onlookers. The safety valve run was the first club event to utilise the enormous benefit gained from the installation of the verandah. Although it didn't rain it provided excellent cover from the cold conditions. It was great to see other kindred clubs in attendance, namely Railway Park, Penfield, Roseworthy and Morphett Vale.

Winter Running on Sunday 7th July was a bumper crowd day and apart from being cold and sunny it was notable for the fact that more boats operated than locos. It was a grand sight to see the boat pond playing host to eleven water craft plus a hot air engine on the sidelines.

South Australian Society of Model & Experimental Engineers
Location: *off Millswood Cres, Millswood*
Public Running: *1st Sunday , 3rd Saturday*

Moorabbin, Vic

Castings have been obtained and machining of same is well underway for the replacement bogies for the GLT passenger stock.

A steaming bay is to be constructed at the front Garden Gauge layout to both to remove such activity from the main circuits and also enable the public viewing of loco preparation for their further interest.

On the Garden Gauge, Warwick Brisbane's G1'G' class diesel is progressing very well with the brass upper works almost complete, plenty of rivets and other detail. Neil Riches is modernizing his fleet with a SD45 CSX loco and a Budd Railcar. Allan Tregea showed a Sandy River pulpwood car built from a kit. He had brought the photos in a book to show that it was authentic. He has also showed a work car with everything including the kitchen sink, plus a crew to do the work, built from scratch with the various attachments from many sources. It shows what a little imagination can do.

Steam Locomotive Society of Victoria
Location: *128 Rowans Road, Moorabbin*
Public Running: *1st Sunday*

Newcastle, NSW

Our new grader called "Moon Raker" which is to be towed behind the "Moon Buggy" has been completed and is undergoing trials. A roller (which is yet to be named!) is the next phase of this operation.

Members have been involved in several special (or extra) runs lately. At the Elermore Vale Pre School there were the ideal number of locos in steam for just over 100 guests that were in attendance so that we didn't have to wait long before we had passengers to carry. Everything ran very smoothly with no hold ups as the bridge painters had a lookout to warn of approaching trains. Any smart comments were greeted with the threat of having a green or brown stripe painted along you or your loco. These two hour runs are very pleasant because of the make up of the guests. Other runs include First Chance and Hearing Impaired, NSW Interclub Run at BMRS, Blaxland, Barnsley Public School, Autistic Children Hunter School, Mudgee Wine Festival (as usual we attended the third weekend), Malcolm Sargent Foundation, Hornsby Model Engineers Birthday Weekend and Stockton Public Pre School

Lake Macquarie Live Steam Locomotive Society Ltd
Location: *off Velinda Street, Edgeworth*
Public Running: *Last Sunday (ex. Dec)*

New Plymouth, NZ

A ten metre section of track between the top tunnel and overpass has been rebuilt. The concrete base had subsided quite an amount as well as cracked and rolling over towards the fence. This resulted in the track having been packed up and propped up in various ways to the extent that the committee members considered the track was becoming dangerous.

The track section was removed from the base and dismantled. Rails were straightened and the whole reassembled with new spaces and new bolts replaced, the old bolts deemed unserviceable. A concrete cutting contractor was employed to cut the base into manageable bits. As it was necessary to get rid of the concrete the opportunity was taken to tidy up the mess at the shed so a skip was ordered for the job.

The reassembled track was put into position on temporary profiles, the ends rewelded to the existing track and the inside rail at the centre joint was also welded. All bolts were finger tightened. Surprisingly the track took up its correct alignment.

Next six square wooden piles, with saddles bolted over their tops were suspended at even spaces below the rails into holes previously dug. These piles were plumbed and concreted into place. 10 x 50 steel was laid on top of the saddles under the rails and the ends were welded to the outside rails. The saddles are slotted where they fit down over the piles with two through bolts. This will allow for future adjustment and for ease of setting the super elevation. Provision is made for a locking through bolt to prevent the saddles from slipping down. A possibility once the piles dry out a bit. Next the track bolts were tightened along with re-gauging. A set screw was put through the 10 x 50 and tapped into the top of the saddle to hold the track in position. It is intended to replace these screws with saddles - so hopefully some track expansion can take place. Finally galvanised pipe was placed each side of the piles as an anti-tipping rail and all rail joints were welded and ground.

The job was started on a Monday morning and the track was back in service again before the next Sunday's running.

New Plymouth Society of Model Engineers
Location: *cnr Liardet and Gilbert Sts, New Plymouth*
Public Running: *Every Sunday*

Perth, WA

Fine spring weather brought passengers flocking back to Castledare for the November run day. It was satisfactying to finish the day without a single hold-up, which perhaps reflects the club's recent emphasis on maintenance and assurance of members' operating qualifications. There were numerous compliments from a good-natured public who clearly enjoyed their day out at the railway. The day started well with a ceremony for the club's senior member, Bob Burgess, who cut the cake for his 93rd birthday before joining the operating team for a hard day's work running the railway.

The maintenance effort continues to improve the appearance and functioning of the railway facilities. A bore has been sunk to provide water to keep the public areas green during the summer. The first attempt at bore sinking was a disappointing "duster". The club then secured the services of a water diviner, who identified a spot and the result was a satisfying "gusher". A reticulation system is to be installed to make best use of the new water supply. Further upgrading of security is also taking place, following some break-ins at the canteen.

Drawings have been received for the enlarged 5-inch gauge shed, and work on the extension is due to start shortly. This will provide much needed extra space within the club's main building complex. Track re-alignment at the Fern Road junction continues.

Our club can be contacted via the secretary, Ken Belcher, on (08) 9375 1223, email: skbelcher@wiredcity.com.au

Castledare Miniature Railways of WA Inc
Location: Castledare Place, Wilson
Public Running: 1st Sunday
http://d1565.tripod.com/cmr/

Warner, Qld

Year 2002 has come and gone and a new one has just dawned. Our new year resolutions have by now almost been spent, though one, however, should remain with us all. That is interest in your hobby. At Warner an unwritten resolution is to continue to provide an interest to our members and the one thing alone that sharpens that interest is the ongoing improvements to our site. To not have these changes would, I believe, cause many members to lose interest as it is through the many facets of development that we cater for a wide variety of the members needs. Improvements continue to the new track including dry pitched stone walling near the spiral entrance, the round house with preparation for the uprights, the landscaping including gardens and paths, the library with shelving to house the books and magazines and signalling. In late September we once more had the open weekend at the President's retreat in the Gold Coast hinterland which provided an extra interest for those members who attended. November was our Trophy Day and I will report on the results in the next issue. A happy and rewarding new year to you all from Warner.

To visit, Contact the Secretary, PO Box 322 Everton Park 4053. Note: All persons wishing to run equipment at our site must have AALS Insurance.

Qld Society of Model & Experimental Engineers Inc
Location: *122 Warner Road, Strathpine*
Running Day: *2nd Sunday except December, by invitation. No public running*
http://www.steammachine.com/qsmee/

Whangarei, NZ

At the recent AGM, incumbent President Roger Reynolds was able to again take the lead for the coming year as was Vice President Wally. Joyce Ryan has once more agreed to be patron and David Evans will continue to be Secretary.

The June running day saw an excellent number of members turn out — unfortunately not a great many passengers, but only to be expected as it was the first of its kind. Roger Matson steamed up his *Beejax* and carried out the tests necessary for gaining a new steam ticket. Roger Reynolds was also firing up another *Beejax* with Marty, and having completed a hydro. test recently is almost ready for a new steam certificate test.

Whangarei Model Engineering Club
Location: *Heritage Park, Hwy 14, Maunu*
Public Running: *????*

(Congratulations to the Whangarei team for getting their new track to the stage where public running days are back on the agenda. This is always a huge undertaking for any club. No doubt we will get a full report on the whole exercise soon. Also, well done to club president Roger, who decided to build a new house at the same time! Must not have had enough to do!! ... Ed.)

Farewell

We say goodbye and thankyou to one model engineer who has passed on:

Arthur Stancliffe (Gippsland MES)

and extend our condolences and best wishes to the family and friends he leaves behind.

Club Roundup

Most of the material which appears in *Club Roundup* is gleaned from **club newsletters**. although an increasing number of clubs are **emailing** or **faxing** us a special "report" for this column.

If you don't already send us a copy of your club newsletter (and several clubs don't) how about giving it a go, or email or fax us some news from your club. What may seem mundane to you may be interesting to others!

You can **post** to:
PO Box 21, Higgins ACT 2615
Fax to: (61 2) 6254 1641
or **email**: amemag@bigpond.com

CLUB DIRECTORY

A full club listing will be published in the next issue. If your club's details have changed and you have not recently advised us, now is the time to do so. At the same time we will be doing a full update of club details on our website. We need to receive any changes by January 17.

Coming Events

21 to 23 February 2003
50th Birthday Run — Edgeworth NSW

The Lake Macquarie Live Steamers invite you to celebrate this special event with them. See ad on page for more details.

17 to 21 April
47th AALS Convention — Salisbury North SA

The Penfield Model Engineers Soc are hosting the next AALS Convention. Information packs and registration forms have been sent out to clubs. For full details see page 58 in the last issue or see your club secretary.

17 to 18 May
Inverell Pioneer Village Autumn Run

For all road steam engines. A BYO event. Due to drought all engine drivers must prevent escape of all steam not required for actally propelling their engine. Contact Gordon (02)6722 4272 or Peter (02)4951 2369

8 to 12 January 2004
Steam & Steel 2004 — Hamilton NZ

The Hamilton Model Engineers are hosting the next New Zealand Convention. Full details will appear in the next issue (also were on page 44 in issue 103). For more information about this great event contact Valerie Clarke at 51 Alderson Road, Hamilton New Zealand. Ph. 64 7 8551 927, Fax 64 7 8551 307 or email bandvclark@xtra.co.nz

Central Coast Interclub and Birthday Runs

by Rob Lougher

Over recent months the Central Coast Steam Model Co-op has held two major events on the model engineering calendar.

The first being over the weekend of June 29-30 when the Inter-club Run was held and then over the weekend of August 3-4 we held our 21st Birthday run with both events being reasonably close together we decided to send a combined report.

On the Saturday of the Inter-club run the weather was cold, windy and cloudy and whilst this may have been a deterrent to some people a good day was had by all visitors and members alike with a lot of visiting locos and some new club locos getting their first run. There was also a fairly good turnout of members from other clubs who simply came to visit and catch up with old friends.

Saturday night's dinner was well attended by both members and visitors and Sunday saw another day of running although somewhat quieter than Saturday possibly due to the cooler weather.

The Birthday Run went without a hitch thanks to the hard work of our members over the preceding months to have the track and grounds ready for both events.

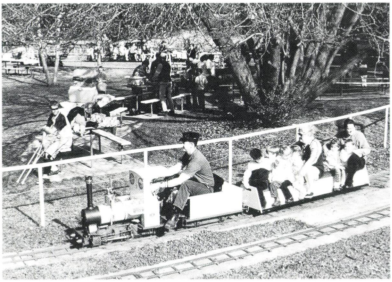
Thanks also to Huey the weather god and his mate El Nino for the fine weather.

The Saturday was well attended by members, guests and the public we carried close to 1000 passengers including two birthday parties. The number of passengers helped to make the day a financial success.

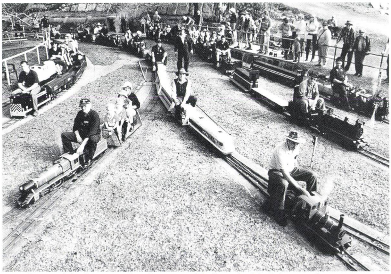
Saturday also saw a large number of visiting locos from the Lake Macquarie club as well as visitors from other clubs such as Hornsby and Sydney Live Steamers on the track with our own locos .

Both these events have given us a chance to test out our new 71/4" unloading bay and the progress of the signal system both of which performed OK and the chance will now be taken with theses events finished to further refine this equipment.

Thanks to the Lions Club for their help with the BBQ lunch on Saturday and dinner on Saturday night and a special thanks to the club's newly formed (albeit impromptu) Ladies Auxiliary Edith, Helen, Margaret, Tina and Sharon who organised the food, the cake and the catering for Saturday night. This group of ladies has swung into action not once but twice at short notice first for the Inter-club Run and then for the Birthday Run.

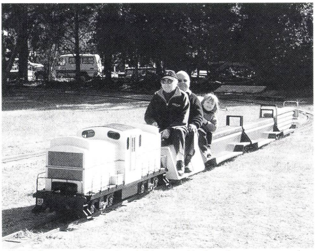


Not a heavy task as Paul Dove moves another load of passengers with visiting locomotive Edgeworth David Photo: Grahan Bearman



Some of the locos and trains assembled on the birthday run for a group photo while a few of the public look on. Photo: Graham Bearman

Well known City Rail driver and model engineer, Mark Carney takes Leon Brack's Narara Valley Logging Co. no. 4 for a spin. Photo: Rob Lougher



Edith Bearman gives the club's new 41 class loco a run on the Sunday morning of the Invitation Run. Photo: Rob Lougher

North American Happenings 2003

Information supplied by Lindsay McDonnell

Meets scheduled by British Columbia SME:

Easter Meet — April 18 - 21 (The opening of our season)

Annual Meet & Ramble Meet — July 4 - 6 This will be the culmination of a rail Ramble from Phoenix, Arizona through California to Train Mountain OR to BC, Canada

Annual Train Festival Meet — August 8 - 10, Our busiest Meet of the year.

The BCSME track is located just 7 miles from downtown Vancouver and comprises 2 miles of $7^1/_2$" track and a raised $3^1/_2$"/5" track under construction (not ready for 2003). Track location and running in *Club Roundup*.

The Train Mountain and Canada Ramble schedule:

The following 7.5" gauge tracks will be open for running or visiting in 2003:

June 7-10	Maricopa Live Steamers, Phoenix, Az.
June 10	Scottsdale Live Steamers, Az.
June 11	*travel day*
June 12	Joshua Tree & Southern RR Club, Ca.
June 13	Riverside Live Steamers, Ca.
June 14	Orange County Modell Engineers, Costa Mesa, Ca.
June 15	Los Angeles Live Steamers, Ca.
June 16	Bitter Creek Western RR, Arroyo Grande, Ca.
June 17	*travel day*
June 18	Golden Gate Live Steamers, Berkeley, Ca.
june 19	Sacramento Valley Live Steamers
June 20	*travel day*
June 21-29	Train Mountain RR Museum, Chiloquin **OR**
June 30	Southern Oregon Live Steamers, Medford **OR**
July 1	Tom Miller's RR, Scholls **OR**
July 2	Kitsap LS, Port Orchard, Wa
July 3	Vancouver Is. Model Engineers, Saanich, BC. Canada
July 4-6	British Columbia SME, Burnaby, BC

In addition:

- Martin Rogers invites invites Model engineers to visit and/or run on his Cowan Point Railway, Bowen Is., BC on Monday July 7.
- West Coast Mini Rail at Squamish Rail Museum will open July 8 for running.

Holbrook Miniature Railway

The first move to have a passenger carrying $7^1/_4$" miniature railway in Holbrook, southern NSW, was back in 1999 when the Holbrook Chamber of Commerce purchased an existing miniature railway setup from Strathalbyn in South Australia. After much discussion, the Holbrook Shire Council decided to allow the project to be located in the beautiful Ten Mile Creek Gardens in the centre of Holbrook. After a further delay and opposition from one of the councillors, the Development Application was approved and construction work began in November, 2001.

The rail track is laid on a concrete foundation and is 565 metres long. The track starts near the swimming pool, follows the south side of the creek and passes under the Hume Highway bridge. It continues along the creek and crosses the creek over a curved railway bridge, back along the creek, under the Highway again to the upstream curved railway bridge.

Progress so far — the full circuit of steel rail is in place, a loop at the passenger station is also in place. A 40 foot shipping container is in place in the back yard of the Holbrook Museum to act as a storage shed for locomotives and carriages. Work is in progress on the loading/unloading facility and soon construction will commence on the passenger station building. Work is also being done on three locomotives which were included in the equipment bought from South australia. Also, work is to be done on our existing carriages and some carriages will have to be built or purchased.

All work done in building this miniature railway is by local volunteers. All machinery used has been supplied by the owners at no cost. Funds to purchase materiels, etc. have been donated by Holbrook and district residents and local companies. All work has been paid for and the construction committee will be able to open the railway free of debt. No financial help has been obtained from Federal, State or local Council. This project just shows what a small country town and district can do.

— Leo Mackinlay

AUSTRALIAN MINIATURE BOILER SAFETY COMMITTEE

The "Kettle"

Newsletter of the AMBSC No. 2002/01

This space has kindly been provided by *AME*, in order that we can better disseminate information regarding miniature boilers, etc. Whilst we hope to maintain a bi-monthly column relating to both technical and safety matters, we do not intend this to develop into a "question and answer" strip. We would much rather that you send your queries to us direct, then we can answer them direct. Any matters arising of a general nature can then be "aired" in this column. In any case, "no names, no pack drill".

The first item that we have has been mentioned before, particularly to Boiler Inspectors. This is the provision of washout plugs in all boilers. This rule has been in our Codes since the first one published, and we still see them left out! One blowdown valve in the foundation ring is not sufficient, in our opinion.

The second point is like unto the first, and covers red lines on pressure gauges. This is a Statutory requirement, and again, we still see boilers around without it, or it's very faint. In these days of extreme litigation, almost any point will be picked on in the event of an "incident".

The availability of copper is becoming a big problem in the sizes that we use. This is now leading to a large amount being imported, and will probably require a certificate being provided with every piece, as for steel. We have had instances of sheet copper being almost impossible to flange, leading to cracking, etc. Be very wary of any copper that "rings" when struck with a metal object!

We published Issue 7 of Code Pt 1 last year, and already a number of anomalies are showing up. To enable us to rectify this would anyone who has noticed anything that doesn't "gel" please let our Secretary know (in writing, please)? This also applies to any copper sizes that you have tried to obtain.

We are currently running low on Code Pt 2 (steel boilers) stocks, so prior to a re-issue, could we have constructive comments, please? Some time ago we issued a draft copy of the first of the Boiler Inspector's Handbooks, on Inspection. This was our first attempt, sent to all Boiler Inspectors registered at the time. If you want it published "as is" please let us know. We've had very little feedback, and it is for your information. You don't have to be a Boiler Inspector to reply.

Thanks for all that, in anticipation. Hopefully we'll be back next issue with some more (we hope) useful information.

I Kirby (Chairman)
D H Merrifield (Hon. Secretary)
November 2002

UNDER 25S ENCOURAGEMENT AWARD

2003 Entry Form

Name .... Age ....

Address ....

....

.... Phone ....

Club or Society (if applicable) ....

Qualifications and/or occupation ....

....

....

Brief description of entry ....

....

....

....

Approx. dimensions & weight .... (enclose photo if possible)

Equipment used in construction (e.g. lathe, drill press, hand tools, etc.) ....

....

....

....

Other information relating to the entry (e.g. outline of construction and assistance had, if any) ....

....

....

....

Australian Model Engineering undertakes that the privacy of entrants will be respected.

I hereby declare that:

1. I have personally constructed at least 75% of my entry
2. I was under 25 years of age as at 31st December, 2002
3. I agree to the conditions of entry and that the judges decision will be final
4. I agree to display the entry at the 2003 AALS Convention site for the purposes of judging.

Signature .... Date ....

The AME Under 25s Encouragement Award

Conditions of Entry

Younger model engineers are making great contribution to the hobby, even though they are often hampered by having less access to tools and resources than older model engineers. *AME* instigated this award in 1993 to encourage under 25s to show their talents; to engender a spirit of encouragement in more experienced model engineers; and in a small way to foster the growth of participation by people in the younger age range.

We've been pleased to hear that a number of under-25s have been spurred on to complete their models by the thought of participating in the award.

If you fit the age criteria, photocopy the entry form on this page, post or fax it to *AME* and start a-fittin' and a-turnin'!

Age criteria

If you turn 25 in the 2003 calendar year or later, you are eligible. If you turned 25 in the 2002 calendar year or earlier you are not eligible.

Entries

May be any model or experimental engineering item or model. For example it can be a steam, diesel or electric outline locomotive; steam, internal combustion, electric, hot air and Stirling cycle, stationary or mobile plant or road vehicles; boats or ships with any form of power drive; marine plant; workshop equipment, jigs, fixtures and aids to manufacture; clocks and other horological or astronomical items; electronic, programmable logic, digital and analogue controls and monitoring of any of the above models or any other item(s) which the judges consider relevant to model engineering.

Judging

The following are taken into consideration:

- Age of the entrant and skills relevant to age.
- The ambitiousness of the project.
- The workmanship of the project.
- The access to workshop facilities.
- The location to resources and materials.
- The formal skills of the entrant.

The above is intended to even out the playing field so that the judges may look at each entry all things considered. The idea is that the 13 year old student (with no formal mechanical skills) from the Back'O'Bourke who works in a tin shed with pistol drill, hacksaw, file and hand scraper to build a model of a ferris wheel has as much chance as the 25-year-old qualified thou-splitting toolmaker with a CNC workshop and limitless resources who has turned out a VR H class 4-8-4 with working stoker engine!

Have a go!

The presentation will take place at the AALS convention at Penfield this coming Easter. Entries will be received up to day one of the convention. The perpetual trophy will be awarded at the AALS presentation night on Sunday evening. A prize (to keep) relevant to the winner's interest in the hobby will also be presented.

So come on all you younger model engineers, let's see the tables with plenty of entries on them in Adelaide this Easter!

Expoxy Sand Casting

For a Small I.C. Hit and Miss Engine

Story and photos by Stu Martyn

I am relatively new to the art of model engineering and like other modellers still get that buzz of satisfaction and special thrill to see a model, (which started its life as an idea prompted by a photograph or an article in a magazine such as *AME*) built from scrap material and with the help of numerous sketches, actually perform beyond my wildest expectations!

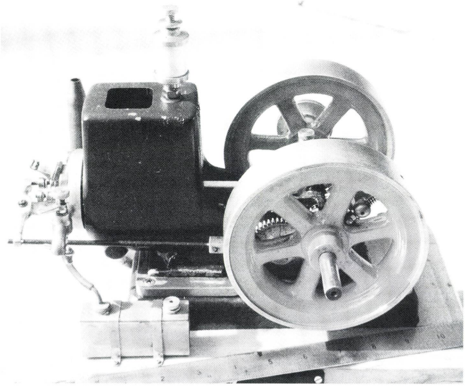
At the time of writing I have built about two dozen working models, each one different, (I get bored doing repetitive work) ranging from hot air engines, high and low speed steam engines, a 1/15 scale Fowler steam tractor, steam car, calliope, gauge one 2-10-0 locomotive (*Evening Star*) and three petrol internal combustion engines (two hit and miss and one Atkinson).

This article is about one of the Hit and Miss I.C. engines.

My earlier years were spent on a Central Queensland cattle station of which my dad was manager. Dad didn't possess a great deal of mechanical knowledge, which was a bit of a problem as a fair number of water pumps on the station were powered by the old hit and miss engines. I can still see my dad walking away from a Rosebury that he had just managed to coach into starting after much adjusting/fiddling with knobs, cursing and vigorous swinging of the crank handle. The Rosebury made a unique exhaust noise, firing lustily and with vigour, until the engine reached its preset maximum speed at which the governor opened the exhaust valve and the engine coasted almost to a stop whereupon the whole process was hopefully repeated. As dad walked away, his steps matched the varying beats of the Rosebury.

I managed to locate *AME* issue 50 (Sept - October 1993) which contains an excellent article on the old hit and miss engines titled *A Hopper Cooled Open Crank I.C. Engine* written by Russell Paynter. This article revived my childhood memories and I decided to build my own, making my own castings using a furnace which I had recently aquired.

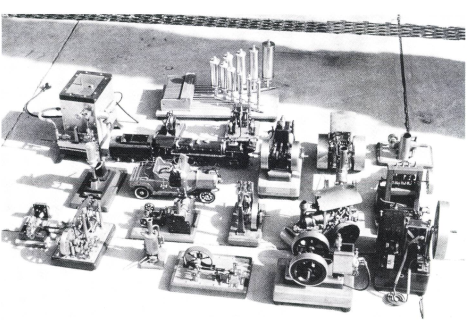
When I started this exercise my knowledge of metal casting and foundry work could only be described as ZILCH ! The foundries I approached had absolutely no interest in sharing their knowledge or assisting me in any way and it was with pure luck that I met up with a foundry supplier who introduced me to resin cured sand, more commonly known as epoxy sand. This sand, when poured onto a hot pattern (200/300°C.), cures into a solid block and retains to a high degree of accuracy all of the features in or on the pattern. I decided this was the way to go even though I would have to make my engine patterns from a material that would stand the heat required to cure the epoxy sand moulds. I elected to use aluminium.



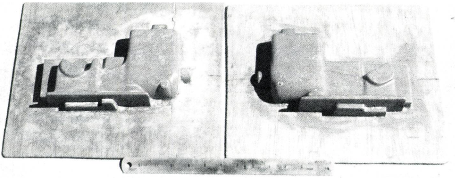
The Hit and Miss engine which is the subject of this article

Since I only had Russell's article to go on I had to initially decide on the model's size. The final decision was dictated firstly by my lack of confidence in my ability to successfully cast something as stressed as a piston plus the fact that I already had the skeleton of a discarded whipper snipper acquired from a scrap yard which luckily came complete with piston, rings, gudgeon pin and retaining circlips.

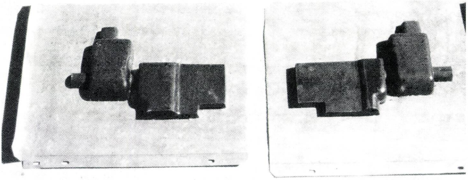
The model as initially sketched up had



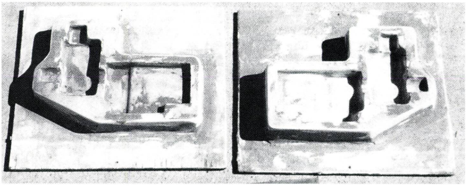
As you can see from this selection the author has been a prolific builder of steam engines



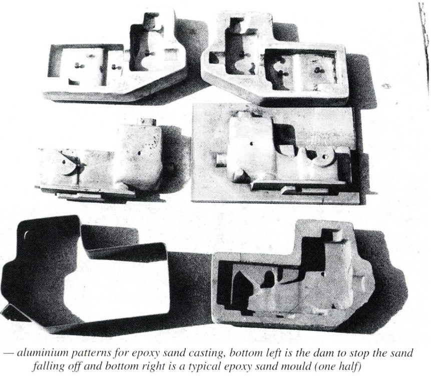
The gelutong pattern for the exterior casting



The gelutong pattern for the core



Plaster of Paris moulds taken from timber patterns for the cores



Top — aluminium patterns for epoxy sand casting, bottom left is the dam to stop the sand falling off and bottom right is a typical epoxy sand mould (one half)

a bore to suit the whipper snipper piston of 31mm, stroke of 38mm, overall length of 290mm, height of 220mm to top of oiler, width of 190mm with 140mm diameter flywheels.

Moulds for the exterior shape

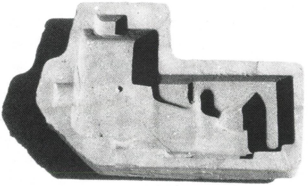
The moulds for the exterior shape of the engine started out as timber (Gelutong) from which I then made a green sand mould. Green sand moulding is an acquired art which I don't think I'll ever have! If the sand is too wet it sticks to the pattern like the proverbial. If it is not moist enough it won't retain its shape and has the tendency to collapse and fall apart. Not the best of predicaments!

I found by trial and error that by adding some white bread flour to some sifted backyard sand (there is no shortage of sand here in Perth) that the green sand retained its shape better. It also filled my workshop shed with smoke and made it smell like a bad bakery during the pouring process! I wasn't game to push my luck by putting a "lid" on the green sand mould in case it fell in. I just poured the molten aluminium into the depression made in the sand by the timber mould and then milled the excess material of the back of the half pattern after it had cooled. I should mention that two half patterns (one each for the left and right halves) were needed for the external shape of the engine. Each of these half patterns was then fixed to a 10mm thick flat plate by metal thread screws. The backing plates were made larger than the patterns to allow for the installation of a dam to prevent the epoxy sand from falling of the edge. The dam itself was made from a strip of light gauge tin strip. Before pouring on the epoxy sand the half patterns were coated with a release agent which I had obtained from my friendly and helpful foundry supplier.

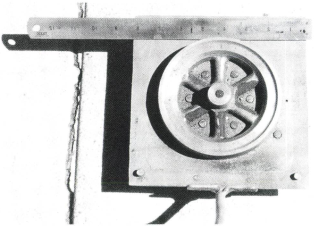
The whole shebang was then heated up on a two ring BBQ gas burner until the epoxy sand had cured hard. The epoxy sand declares its state of curing by changing its colour. After cooling the final epoxy sand mould was released from the aluminium pattern by giving the backing plate a smart smack with a small hammer.

Core moulds

The production of the two halves of the pattern for the core (this was required to provide the open spaces inside the engine frame for the water hopper and the open sump) proved to be more difficult. I set about making up the two halves of the core from timber and then taking a mould of these in plaster of paris. The plaster of paris mould was then used to make a green sand mould into which I then poured my melt, finally giving me the necessary "inside out" aluminium core patterns. I didn't machine the excess material from these patterns thus giving me thicker epoxy sand moulds which I then dressed up by filing to obtain the correct wall thickness. Epoxy sand moulds when cured can be easily further shaped either by sand papering or filing.



One half of an epoxy sand mould



Half flywheel pattern

Assembling the engine mould

The two halves of the epoxy sand core were then glued together using PVA wood glue, placed into position between the two halves of the epoxy sand outside shells which were also glued together, fitted with a pouring sprue glued on and the completed mould placed inside a drag box (a topless and bottomless wooden box frame) then surrounded by firmly packed green sand to prevent the epoxy sand from bursting apart from the pressure exerted by the aluminium pour. I should mention here that epoxy sand moulds are free breathing and as such don't require breathing vents.

Cylinder head, bearing caps and flywheel moulds

Making moulds for the cylinder head and bearing caps was a straight forward process compared to the previous exercise. To make the moulds for the flywheels I made a depression in green sand using a large ashtray, poured the melt as before to obtain a suitable disc. After heaps of drilling and filing, Lo and behold a half wheel pattern! I elected to use straight spokes as that way I only needed to make one half pattern to make as many wheels as I needed. If curved spokes are desired two half patterns are required as both halves must be a mirror pattern of the other.

Crucible

Financial constraints and the need to carry out pours unassisted led me to make my own crucibles. I used an old discarded BCF fire extinguisher cut in half fitted with a pouring spout bashed into its top lip with holes for the lifting rod and a lug welded to the bottom to tilt for pouring. Pouring is a piece of cake! My foundry supplier also put me onto de-gassing tablets which when added to the melt prior to pouring prevents porosity problems in the final casting.

One foundry worker who was a bit more forthcoming than the rest explained that foundry work was easy — all one needed was some sand, some hot metal and thirty years of experience! Well aware of my limitations relating to foundry work and the potential problems which can be caused by incorrect melt temperature, porosity, partially formed casting, Murphy's Law and Lord only knows what else, I tend to double up on the number of moulds I make. Consequently I have ended up with enough castings to make another engine. A very satisfactory foray into the mystic ways of molten metal!

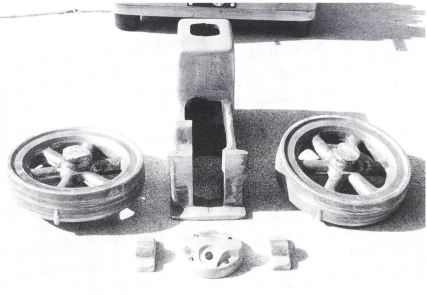
Machining the engine casting

The hopper top and the base of the main frame were milled flat using a Chinese made mill/lathe and the only milling tool I had at that time, a three bladed end mill. Rather than build a jig to support the main frame and mill the main bearing blocks (they are inclined to the horizontal) I elected to file these to shape by hand. The same treatment was given to the bearing caps which were then fixed in position by bolts to the main frame.

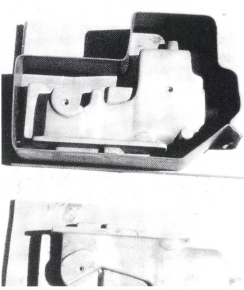
With the main frame clamped to the tool post slide I used a makeshift hole borer (made up from a piece of the same steam pipe 34mm OD as would be used for the manufacture of the wet liner) to bore straight through the casting for the wet liner. The casting was then rotated through 90 degrees and the holes for the main bearings drilled out and reamed to suit a pair of needle roller bearings. These bearings can be purchased complete with oil/grease hole.

Cylinder liner

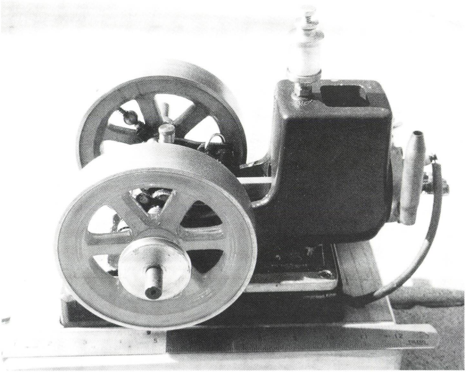
When I was boring the cylinder liner I



Assorted aluminium castings for the Hit and Miss engine



The pattern in place in the dam



The completed Hit and Miss engine

discovered a hard spot in the pipe introduced during its manufacture. Easily overcome, just annealed it and finished the job. A brass ring was then brazed to the liner lip to allow the liner to be held in position by the cylinder head. The crankshaft end of the liner was sealed to the water hopper by one of the Loctite products. It is important to have a very good finish on the cylinder bore for models of this size as they seem to look for any excuse not to run and any lack of compression is a good one! I used a cheap brake cylinder hone driven by a hand held drill to give a satisfactory finish to the bore.

Cylinder head

The smallest spark plug I could find was a 10mm NGK CM-6 and even this had to be angled into the cylinder to avoid clashing with the valves. After machining the cylinder head mating face flat I turned a recess into it to receive the cylinder liner lip. After drilling the four 6mm holes for the head hold down bolts, the head was supported by an angled bracket and the spark plug hole drilled and tapped.

I didn't much like the idea of using the aluminium head material as valve seats so I made up two pressed in bright steel inserts which also provided longer valve guides for the valve stems. To complete the head two holes were drilled and tapped $^3/_8$ gas thread one each for the exhaust and inlet ports.

Valves

Rather than turning the valve s from solid material I turned up the valve heads from bright steel and brazed them onto their stems. Stems were $^1/_8$ inch stainless steel rod. Silver solder doesn't seem to stick too well to bright steel and the last thing I wanted was to be embarrassed by a valve head dropping unexpectedly into the cylinder during running.

Conrod and big end bearing

I made the conrod from a piece of 12.5mm aluminium flat and milled it so that it tapered down in size towards the gudgeon pin end. The big end I made from brass reamed to suit the crankshaft journal and bolted to the conrod using two bolts in the conventional manner.

Crankshaft

I made the crankshaft from bright steel 12.5mm rod, the counterweights/webs from mild steel and brazed the lot together. The assembly was checked for trueness on the lathe and excess material machined from the webs. The original engines weren't high revving so I just guessed the size of the weights and have found my engine fitted with what are probably oversize flywheels to sit as steadily as a rock when running.

Valve cam gears

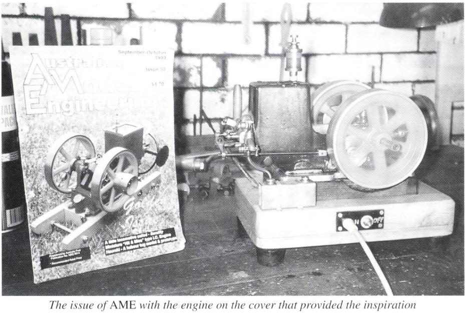
Not having an indexing head I used the direct indexing method with the help of the lathe gear change gears and a jig held in the tool post. I found a book *Gears and Gear Cutting* by Ivan Law in the Workshop Practice Series from Nexus Special Interests to be most informative. Since these were the first gears that I had ever cut and the fact I didn't have any cast iron for the gear blanks, I made the gears from brass. They haven't given any trouble in operation although they are probably noisier in operation than a professionally built set.

Governor

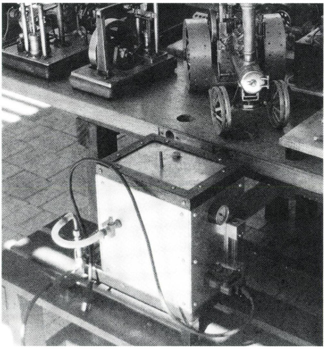
The governor really caused me problems. I couldn't fathom out from the photographs in Russell's article how it actually worked but managed to work it all out in the end. One thing that is critical is the positioning of the governor cam in relation to the exhaust cam. It has to be positioned so that in its over-speed position it can set the trigger which holds the exhaust valve open. It really is an ingenious mechanism. The maximum speed of my model is adjustable my altering the position of the ball weight on it's shaft which is mounted between the right hand flywheel spokes as on the original Rosebury.

Carburettor

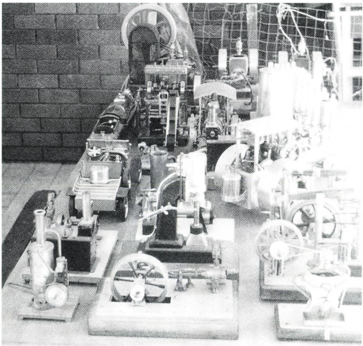
The carby is a very simple unit consisting of a single adjustable needle fuel jet, a barrel type throttle and a choke flap. The jet was drilled 0.7mm and I used an old sewing needle pushed into a piece of threaded brass screw to provide fuel adjustment. I found that a choke flap was required to help suck up the fuel from the fuel tank which is mounted below the carby.



The issue of AME *with the engine on the cover that provided the inspiration*



The steam generator is an old hot water 3-phase system converted to 240v fitted with a Sunbeam frypan thermostat. Feed water pump (hidden) is shuttle valve type. Steams to 30 psi in 15 mins. All models run at 2 - 5 psi.



A selection of the author's steam models ....

The original Rosebury also had a foot valve mounted within the fuel tank to prevent the fuel draining back into the fuel tank and on reflection, a faulty one of these was probably the cause of my dad's frustrations in starting the beasts all those years ago.

Electrical system

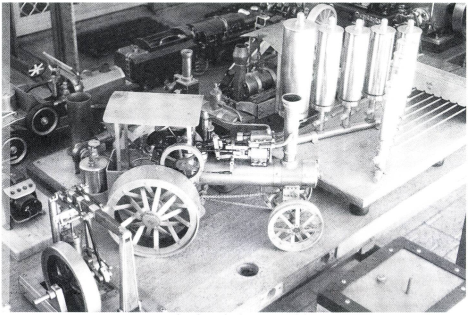
I went overboard with the electrical system using a standard 12 volt ignition triggered by an old set of Kombi ignition points and powered up by a remotely located 12 volt wet cell battery. The points are located inboard of the offside flywheel. The ignition HT coil is quite large in relation to the model so to hide it I put it under the engine and hid it within a timber base.

Lubrication

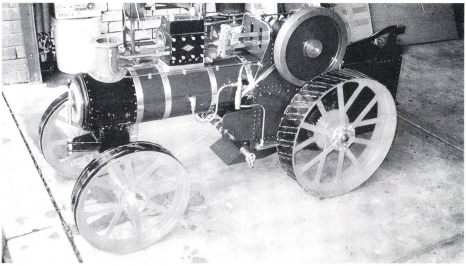
Cylinder lubrication is provided by an oil drip lubricator mounted above the water hopper. This lubricator is of the adjustable type with it's needle valve made up from a stainless steel meat skewer, the sight glass commencing it's life as a pharmaceutical pill bottle! The big end and main bearings are grease lubricated using screw down grease caps.

Building this engine from scratch has been a challenge but well worth the effort to see it perform and I would be prepared to supply the basic castings at nominal cost to any other modellers who would like to give it a go.

Murphy did arrive on the scene —when I first fired the engine up to skite in front of friends one of the flywheels came off and did the circuit of the shed! I had taken the shortcut of using grub screws to hold the flywheels to the crankshaft (not having the gear to cut keyways). This was remedied by the use of one of the Loctite products.

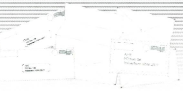


.... and a closer look at some of them



The author's 6" scale Wallis & Steevens traction engine was featured in AME *issue 102*

Letter Box



Spring NSW Interclub Invitation Day

Sir,

On behalf of the directors and members of the Blue Mountains Railway Society, I would like to take this opportunity to thank all our visitors for making the recent Interclub run such a success. On the day we had well over 100 visitors and over 20 locos were in attendance. This was well above our expectations and the fact that everyone has either written, phoned or otherwise expressed their satisfaction is very rewarding to the members of our club.

As anyone who has organized an event will testify, regardless of the effort put in by the host, the visitors are the people who make or break the day. In our case, our visitors made our day and all the work that went in to host the event was well worth it.

Once again, thankyou for attending and we hope to see you all soon either at Wascoe Siding or another venue. Good steaming.

Jim Auld

Secretary, Blue Mountains Railway Soc.

Insurance - value for money?

Sir

Your editorial (September-October 2002) referring to the group insurance as "still the best value for the model engineering hobby" has prompted me to put an alternate point of view. By now most clubs would be aware that MELSA Maryborough is no longer a participant in the AALS group insurance scheme. The reason we sought alternate cover is simply that we could not afford the premium. Faced with other financial commitments and an insurance premium in excess of half our annual income gave us reason for concern. Like any organization operating as a small business which has a budget, we looked hard where costs could be cut, and considering our major expense is spiraling ever higher, we started with our insurance premium.

It has long been our executive's opinion that a good liability cover without any frills is all that we really need. With 65% of our members living 3 hours or more from the club track, at addresses like Taroom or Jabiru, the likelihood of a run for them is limited to about once a year. Not one of them needs marine insurance, and as their motor vehicle insurance will cover a model in transit, do they really need this cover again?

Our secretary worked long and hard to research and arrange a cover suitable for our needs. He finally found liability insurance cover, approved by APRA (the Australian insurance industry watchdog), for a premium of less than half of the AALS group scheme. Our cover exceeds the recommended cover of the Queensland Justice Department and is acceptable to the local government in whose park we operate. Incidentally, the same insurance company has now covered the operation of a full size steam locomotive (operating through the same park) with cover suitable to the stringent requirements of Queensland rail and the network regulator (Network Access), a branch of the state government.

We are still affiliated with the AALS and in the future, should their insurance premium become more competitive, we would be happy to consider returning to the group scheme.

George Bishop

President, MELSA Maryborough

(In my editorial a couple of issues back, I did say that at that time the group scheme appeared to be the best value for money and that in the present climate clubs would be prudent to stick with it. It is over a year since MELSA made their decision to change, which considerably pre-dates my editorial, and in the intervening period, circumstances have not improved. As editor (and as a model engineer) I have no preference for one insurer over another and in fact I must confess to little respect for any of them. I do believe that it is the duty of any club or organization to obtain the best deal for its members, and when it comes to insurance, that really means the best or equal cover at the lowest cost — clearly the motivating force behind the decision taken by MELSA. If, as they say, their insurance is approved by APRA, is acceptable to the local council and Queensland Government and now being used by QR, is there really a problem? ...Ed.)

Drilling and cutting copper

Sir,

The 14th Model Traction Engine and Steam Road Vehicle Rally recently held at Tuggeranong, ACT was a great success and as co-convenors of the previous rally at Mannum, we wish, on behalf of all the delegates and guests who attended, to thank John and Phyl Oliver, Dave Proctor and all the members of CSMEE who assisted with the running of the event. Again, many thanks.

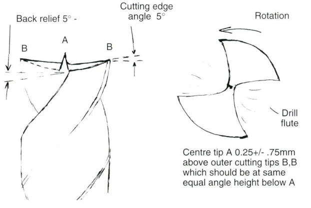
My latest *AME*, issue 105, has just arrived and been "devoured'. Whilst at the ACT quite a few people talked with me re copper boilers, knowing I have just finished my Yarrow style vertical water tube unit for *Wombat* and after reading with great interest the article by Bob Brown, *Boiler Building for Beginners*, would like to suggest some alternative approaches.

In Fig. 4, page 12, the drill bit is effectively shown as standard except that (quote) "the drill must be sharpened to a negative rake to the cutting edge." There is a much cleaner and safer way of forming a hole, especially in sheet metal such as copper, aluminium, and plastics, etc., and this is a standard drill bit sharpened to form a "sheet metal" drill as per the sketch. This method of forming holes has several benefits.

The centre projection easily locates in the centre-punch hole and during the forming operations, acts as a "steady" preventing chattering.

Cutting starts at the outer edge of the drill and progressively moves right in to the centre, the two drill lands again reducing the tendency to chatter. If the drill bit is correctly sharpened both edges cut simultaneously two equal sized and shaped swarfs being produced. As the cutting edges break through the tips of the drill are first and any burr is minimal, especially if the backing media is something which is in compression hardness, similar to the metal being drilled. I scrounge off-cuts of laminated MDF from the local cabinet maker, especially those with the thicker Formica™ and use them face up.

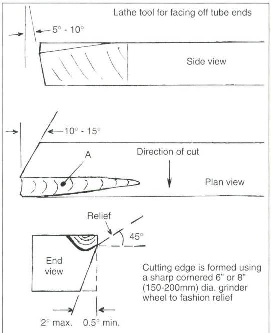
Regarding burrs, one of the quickest and easiest ways to de-burr is to use a mouse, a Black & Decker Mouse™. The kids gave me one for Father's Day a few years back, bless them. These little treasures have a triangular sole (no, not the kids!) and using a 400 grit paper and a bit of mineral turps



Centre tip A 0.25+/- .75mm above outer cutting tips B,B which should be at same equal angle height below A

This type of drill relies on the position of the tip A in relation to the two cutting tips B,B being concentric or at the true centre of the drill body. If the tip is formed off centre by 0.15 to 0.3mm, clearance holes are easily formed in tube plates to provide the necessary capilliary gap to allow the silver braze to run round and through the job

Lathe tool for facing off tube ends



Cutting edge is formed using a sharp cornered 6" or 8" (150-200mm) dia. grinder wheel to fashion relief

With this tool in a very sharp state and using a fine gentle feed with the cutting edge at right angles to the job, burr free finishes on both inside and outside are easily obtained. Warning — do not attempt a coarse cut or use with a very slow chuck rotation speed or the tool will 'snow-plough' into the job — disaster. Also if your lathe has seen better days, nip the gibs up and only use the tool post cross slide in the cutting operation.

as lubricant, you can get all burrs and scratches rubbed down to perfection. Do not use CRC or any lubricant with a non evaporating oil in it unless you have access to a vapourphase degreasing bath — traces of oil on heating carbonize and prevent silver braze from flowing and wetting. I use 'Copha" coconut oil from the supermarket — washes off using household detergent.

Cutting copper tubing to length to produce a batch of fire tubes is more easily performed using a tube cutter, the rolling wheel "G" clamp type, and over the years is a good deal cheaper than broken hacksaw blades. However, they do have the same problem as normal drills — they form a distortion (or lip) on the inside edges of the cut as they break through, which for good "boilermanship" has to be removed. As for finishing to length, I too have a similar jig to Bob's (fig. 8, page 13).

The trick in final machining the ends of tubing is to minimize the production of burrs or bruising, and the lathe tool for this job is shown. The most important aspect is this tool's edge must be freshly sharpened prior to use — especially if it has been used on steel or stainless steel, the edge will be dull.

If this lathe tool is set at 45° to the tube end, de-burring and beveling can be done in one operation with only a slight possibility of producing a "hair edge" on the inside surface of the tube, so only 45° for 80% or so of the wall thickness of the tube!

I hope the ideas contained herein stimulate the converts to model engineering to get up and have a go and hope to catch up with all the Flangeless Wheel Brigade at Timbertown 2003.

John and June Levers
South Australia

Fair go for local suppliers

Sir,

Your *Tracks 'n' Trees* contributor gave a list of suppliers for small gauge live steam locomotives and equipment in the November-December issue of *AME*. All of these had overseas addresses.

To be fair to our local suppliers may I please add them to this list.

Firstly, an Australian magazine, *Rails in the Garden*, is available by subscription, which is issued four times a year for A$15.00. Contact is Michael Bickford, 41 Nalya Road, Berowra Heights. NSW 2082.
email: womloc4@ihug.com.au

Australian manufacturers and suppliers of small gauge equipment advertise in this magazine and in fact, one manufacturer has advertised in *AME* fairly regularly.

Contacts include:

- Argyle Locomotive works. Ph/Fax (03) 5968 6573 email: argyleloco@fhills.hotkey.net.au
- PAMAK Hobbies, Ph. (02) 4684 2727 Fax (02) 4684 2728
- G Scale Hobbies Mobile 0418 624426 email: gscale@qpa.com.au
- Rishon Locomotives Ph. (02) 6629 1115 email: rishon@dingoblue.net.au
- Ferntree Garden Railways and Miniatures Ph. (07) 3206 3665 Fax (07) 3206 2175 email: ftrm@powerup.com.au

Others advertise in *Rails in the Garden* magazine who can supply new and second hand equipment, track building materials, etc. I have no connection with any of these suppliers but have found them very helpful with my enquiries. Cheers

Peter Lukey
Queensland

(The choice of suppliers listed in the last issue was my doing. David Wescombe-Down has supplied quite a large list of suppliers and contacts from all over the world and I made the decision to include some of them in each issue of Tracks 'n' Trees *until we work through the list. The ones I listed in the last issue were chosen simply on the basis of what would fit neatly into the space that was left at the bottom of the page. I have included the above ones in this issue on page 50. My apologies — there was no intent to ignore local suppliers, but if you refer to my* Comment *in the last issue you will see that I simply did not have time to do any "fine-tuning" ... Ed.)*

Letterbox Contributions

You are welcome to send letters by mail to:
PO Box 21, Higgins, ACT, 2615 or
fax to: (02) 6254 1641 or
e-mail to: amemag@bigpond.com

As far as possible, AME is an open forum for all members of our hobby. Therefore, all expressions of fact or opinion as long as they are not libellous will be considered for publication.

News Desk

with David Proctor

The first issue for 2003! Where does the time go? I am at last getting more familiar with the new software so hopefully this issue does not have as many problems as the last one. My apologies to all concerned but I simply did not have time to go back through it to "tart it up" before going to the printers as the software crash already put me nearly 2 weeks behind schedule, and any further delay would have meant no magazine. I must acknowledge the support given by the team at Pirie Printers which enable us to come out only one day late! Some particular points to mention from issue 105 — (i) an incorrect internet address on page 23 should have been http://www.btinternet.com/~historical.engines, (ii) some lines on the centrfold drawing are thicker than they should have been and (iii) a couple of classified ads were omitted. There were a few other layout hiccups which I'm probably the only one to notice.

Requests for info

A future construction series may well centre around a locomotive which started life in NZ and finished up in Adelaide. If any reader has information, photos or anything at all on Canterbury Railways no. 9, later South Australian 'I' class no. 48 (built Neilson & Co, 1873), regardless of what the information may be, it would be appreciated if you could send same or copies to *AME*.

One of our readers is undertaking a survey on the various methods of accommodation model engineers use when they are visiting another track or attending a rally. The main emphasis is on non-motel/hotel accommodation, i.e., the economy approach. These include sleeping in vehicles, tents, trailers, as examples. If you have a novel approach to this topic, how about dropping us a line.

Club listing

It is a couple of years since we last published our directory of Australian and New Zealand clubs. An updated listing will appear in the next issue. **Now is the time** for you to advise us if your club details are out of date and you have not told us in the last six months. The information we need is club location, running days, postal address and website. We will be updating our club listing on the *AME* website at the same time. **This information will need to reach me by January 17 at the latest.** Anything received after that date will not be included.

A parting thought to tide you over: *Support bacteria — they're the only culture some people have.* On that note I should go! Enjoy your holiday season however you celebrate it.

David

Classifieds

3" Foden steam wagon and Foden trailer for sale

- Engineer built to museaum standard (see *AME* 100), copper boiler, compound engine with current boiler cert. $18,500. Contact Peter (02)4951 2369

Large 7$\frac{1}{4}$" gauge 4-8-4 loco for sale

- Based on early Northern Pacific 'A' class. Ideal for heavy passenger hauling, copper boiler with current certificate, superheated, sight feed lubrication. Westinghouse air compressor, full air-braked with A6ET driver's brake valve. Water feed pumps, steel tyred throughout, all axles on twin sealed ball races. Fully overhauled and painted. Priced at $36,000. Contact John on (08)8362 3269

Bunyip castings on rolling chassis for sale

- 2-6-2 for tender or tank engine, most castings and cylinders machined, no flycranks. Plans — stock *AME* mags. Ring John (Cobden, Vic) (03)55951430. $4,300 ono.

For sale — Toy soldiers

- Pewter toy soldiers castings 54mm 1/32 scale, send $5 for catalogue and small sample PO Box 219, Merimbula NSW 2548 Australia. www.microcredit.com.au

Wanted — 5" gauge steam loco

- Capable of 1:40 grades, prefer full working order, boiler certificates, but will also consider any other options. Ph/fax Troy (02)4390 9751

Model machining services

- Examples:- lathe, milling, tapping, boring. Casting done to your drawings. Supplier of tools, e.g. drills, lathe, milling cutters. For further details write, fax, phone Stephen Palmer, PO Box 95, Windsor NSW 2756. Fax (02)4572 5679, Phone (02)4574 0153

Wanted — any pre-1950 Model Engineer magazines,

- Bassett-Lowke *Enterprise* or similar live steamer (for daily running NOT glass case life!) and photocopies of any articles on Drummond Bros 4 inch roundbed lathe, please. Details to "Doc" in Adelaide on (08)8271 3066 or dwescombedown@picknowl.com.au

Machining-fabricating capacity available

- Turning, milling, welding, tooling, will tackle anything. Frank Zizza, 6 Elizabeth St. Euroa. Vic 3666. (03)5795 1551

Classified rates

- $3.85 (GST incl.) per line as published (including heading).
- Don't send payment with ad, we'll invoice you after publication. No limit to the number of words.

Subscribers Free Market conditions

- Non-commercial only.
- Maximum of twenty words, including your contact name, phone number or address.
- On special form provided. (March & September issues).
- 5" gauge or larger locomotives (for sale) are not eligible.
- Only one entry per issue.
- These conditions may be varied at the Editor's discretion

Subscribers' Free Market

FOR SALE

Drilling/milling machine on metal stand. Model TT30, table 9$\frac{1}{2}$" x 23$\frac{1}{2}$", 240 & 415 motors, numerous extras. $850 ono (02)9150 9414

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January-February 2003

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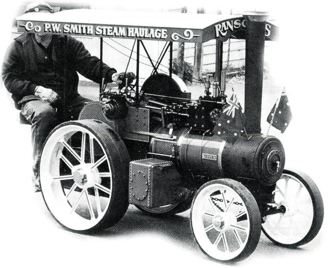

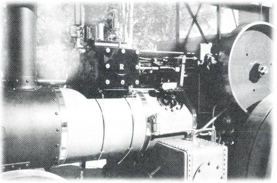

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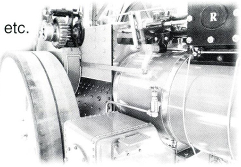
Built: 2000



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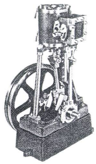

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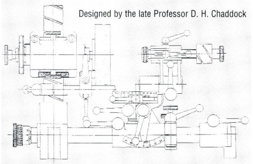

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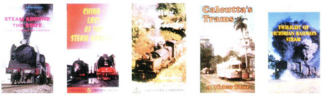

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